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FIELD BOOK OF FORAGE PLANTS ON LONGLEAF PINE-BLUESTEM RANGES

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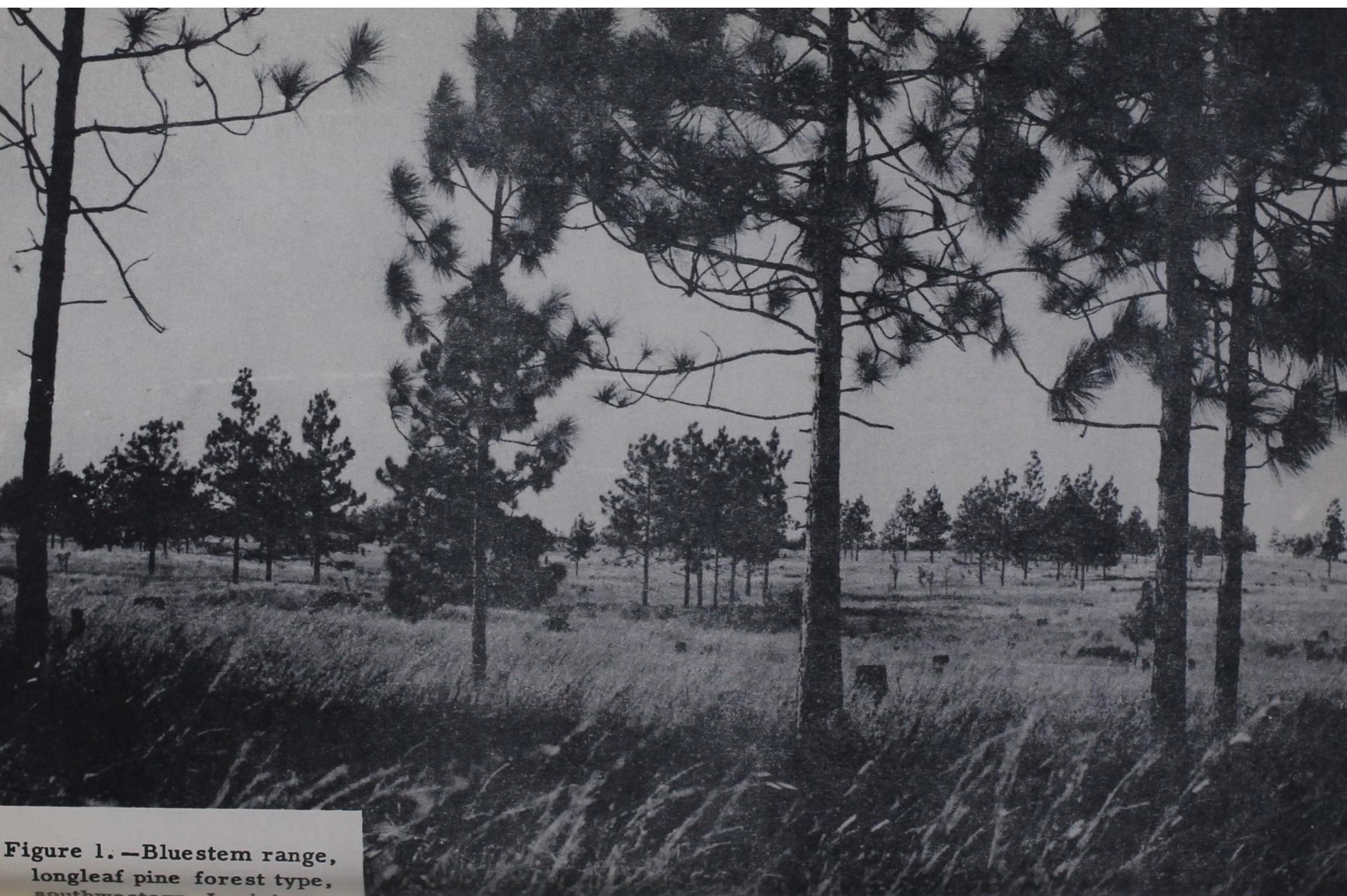


Figure 1.—Bluestem range,
longleaf pine forest type,
southwestern Louisiana.

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LONGLEAF PINE-BLUESTEM RANGES

O. Gordon Langdon, Miriam L. Bomhard,
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This field book is a first attempt to draw together information on the forage and other values of the important plants on the bluestem ranges of the West Gulf longleaf pine region. It includes observations and research that have been accumulated over the past 30 years in one of the most important range forage types in the South.

The primary emphasis is on that part of the bluestem range within the longleaf pine area of east Texas and central and southern Louisiana. However, the observations will have considerable value throughout the southern bluestem type, especially in Arkansas, Mississippi, most of Alabama, and parts of west Florida. In south Alabama and Florida, the bluestem type gives way to the wiregrass range of the Southeast, but many of the species included here are common to both types.

Most of the range plants now found in the West Gulf and adjacent regions are native. The virgin longleaf forests were fairly open, and produced enough grass to support the livestock of the early settlers. The forage stand greatly increased when the old-growth timber was harvested between 1900 and 1930, since much of the land failed to restock to trees. The trend today is toward reforestation, but huge areas are still open, and help to support the rapidly expanding southern cattle industry. Moreover, even well-stocked second growth pine forests--interlaced as they are with natural openings and strips of bottomland--have ample forage for commercial cattle grazing.

Though the main emphasis here is on their qualities as forage, the range plants have other values that will become increasingly important as human pressure on the land increases: they prevent erosion, protect the watersheds, and provide food and cover for wildlife. Knowledge of these understory plants, therefore, is essential to all managers of forest land, whether they are stockmen, range examiners, foresters, ecologists, or wildlife specialists.

Ultimately this field book will be expanded and issued as a bulletin of the U. S. Department of Agriculture. To this end, it is hoped that users will report additional observations on important range plants to the Southern Forest Experiment Station.

Plants, Ranges, and Grazing Values

The plants included in this field book were selected primarily because of their value as forage; a few were included because they typify important plant groups, or are poisonous or especially conspicuous.

Grasses make up about 80 percent of the range vegetation on longleaf pine-bluestem ranges. Grasslike plants comprise 3 percent, forbs 15 percent, and shrubs 2 percent. The average yearlong diet of cattle on several Louisiana ranges studied recently was composed of 91 percent grasses, 4 percent grasslike plants, 4 percent forbs, and 1 percent shrubs (browse). Shrubs were grazed only in fall and winter, when green grass was very sparse.

Individual species attain their highest grazing value at different seasons. The range as a whole, however, is best in spring, when the forage has 8 to 15 percent crude protein, sufficient for good weight gains by all classes of healthy cattle. It is fair in summer, with 6 to 8 percent protein. In late fall and winter, most species have less than 5 percent protein and provide roughage only--animals lose weight unless better feed is provided them.

The foregoing are average values. Nutritive qualities, best season of use, and grazing capacity vary from range to

range according to the proportions of the individual species that comprise the forage stand. For this reason, it is of the utmost importance in grazing management to recognize the individual plants on the range. Recognition is easiest when the plants are in bloom, but the best management requires that the forage be observed throughout the grazing period. The authors have therefore made a special effort to illustrate and describe the marks or characteristics that identify the plants in the field and at all stages of growth.

Acknowledgements

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The manuals and other publications that were consulted are listed on pages 113-114, but are not otherwise cited.

GRASSES

Grasses make up 60 to 90 percent of the ground cover and furnish 70 to 95 percent of the forage for cattle in the cut-over longleaf pine belt of Louisiana and east Texas. There are probably more than 200 species of grass in this area, but the great bulk of the forage and herbaceous cover is made up of ten or fifteen species in three genera—Andropogon, Panicum, and Paspalum. These chief species, with about an equal number of the less important ones, are annotated in this handbook. All of the grasses described here are perennials, and most of them are bunchgrasses (that is, they grow in bunches instead of forming a sod.)

The main characteristics of the family Gramineae may be seen in such familiar grasses as corn, sugar cane, rice, oats, Dallisgrass, carpetgrass, and Bermuda-grass.

The leaves are long, usually slender and pointed, and have veins that run parallel to the midrib. They grow alternately from the stem in two ranks or rows. The blade of the leaf is supported by the sheath, the lower portion that surrounds the stem. In some plants the sheaths are tubular, but in the grasses they are characteristically open, like a tube split down the side.

Grass stems are always either rounded or flattened, never triangular, and have conspicuous solid joints or nodes. The stems may stand upright as in sugar cane or lie flat on the ground as in Bermuda grass. They are usually hollow but sometimes solid.

Individual grass flowers are small and inconspicuous, and seldom have much color. Several flowers are usually clustered into a spikelet, and several spikelets form a spike as in wheat or a panicle as in oats. Each flower (except male ones) can produce only one fruit or grain. Sometimes the male and female flowers are borne separately, as the tassel and the ear of corn.

BLUESTEM GRASSES (ANDROPOGON SPP.)

The bluestem grasses described in the following pages make up over half of the ground cover in the longleaf pine woods and furnish 50 to 75 percent of the forage for range cattle. Thus these bluestems have greater value in protecting the soil and providing forage than all other understory plants combined. Moderately dense stands of the bluestems and associated grasses also furnish good cover for bobwhite quail and other wildlife.

The bluestem forage type of Louisiana and east Texas is essentially a woodland continuation of the tall grass prairie, except that pinehill bluestem (A. divergens) replaces the very similar little bluestem (A. scoparius) as the dominant grass. Bluestem grasses and associated plants form a fairly dense mat of leafy vegetation. Grass densities in open forest range from 50 to 100 percent; the highest densities occur on unburned, ungrazed meadows or swales.

In general appearance, the bluestems fall into two groups—the large, coarse-leaved bluestems which include pinehill, paintbrush, yellowsedge, Elliott, and bushy; and the smaller fine-leaved species represented by slender and fineleaf bluestem. Flower stalks of the coarse-leaved bluestems stand from one to three feet above the leafy mat (fig. 1). New stalks are scarce on ranges not burned or grazed closely for several years, but a striking increase in stalk production occurs the first season after a burn. Slender bluestem, however, produces numerous flower stalks almost every year, regardless of whether the stand is burned; these stalks soon form a heavy tangled mat. The rest of the bluestems usually grow mixed with other grasses and forbs, but slender bluestem commonly forms nearly pure and distinctive colonies (fig. 8).

Identification of individual species is easiest in fall, when the plants are in flower. Flower stalks of the six most important bluestems are contrasted in figure 2. Yellowsedge bluestem has a very leafy, straw-colored flower stalk. Elliott bluestem also has a leafy flower stalk, but is characterized by a fan-shaped tuft of very broad overlapping sheaths near the top of the stalk. Pinehill bluestem and paintbrush bluestem resemble each other. However, each branch of the paintbrush flower stalk is tipped with a distinct fringe of hairs (fig. 4), while the branch tips on pinehill bluestem are slightly enlarged, club-shaped and cupped, and without the fringe of hairs (fig. 3). The flower stalk branches of slender bluestem also have club-shaped, hollow tips, but the stalk itself is much more slender and is bent at each node (fig. 8). Fineleaf bluestem flower stalks resemble Elliott stalks, but are smaller in all respects, leaves included.

Young bluestem plants may also be compared in figure 2. At the center of each young plant is a very short stem, which may elongate in summer to form a flower stalk. Several such individual plants are bound together to form clumps characteristic of the bunchgrasses. Each young plant has a cluster of 4 to 12 leaves. The sheaths are usually boat-shaped or folded, and overlap. Except in slender bluestem, the cluster of overlapping sheaths is very narrow in one dimension and broad in the other—the broad dimension is the one illustrated.

Yellowsedge bluestem has a very broad, glabrous (hairless), light yellow, glossy sheath cluster. Sheath clusters on Elliott bluestem are similar but not so broad or light-colored. The sheath clusters on pinehill and paintbrush bluestem are slender and hard to tell apart. Paintbrush leaves are often more densely bearded than those of any other species discussed here. Sheath clusters on pinehill bluestem are usually purple and make a quarter twist at the ground line.

Fineleaf and slender bluestem have smaller leaf clusters and fewer leaves than the other five species. In fineleaf the base of the cluster is flattened as in the larger bluestems, but the slender bluestem sheath clusters are rounded.

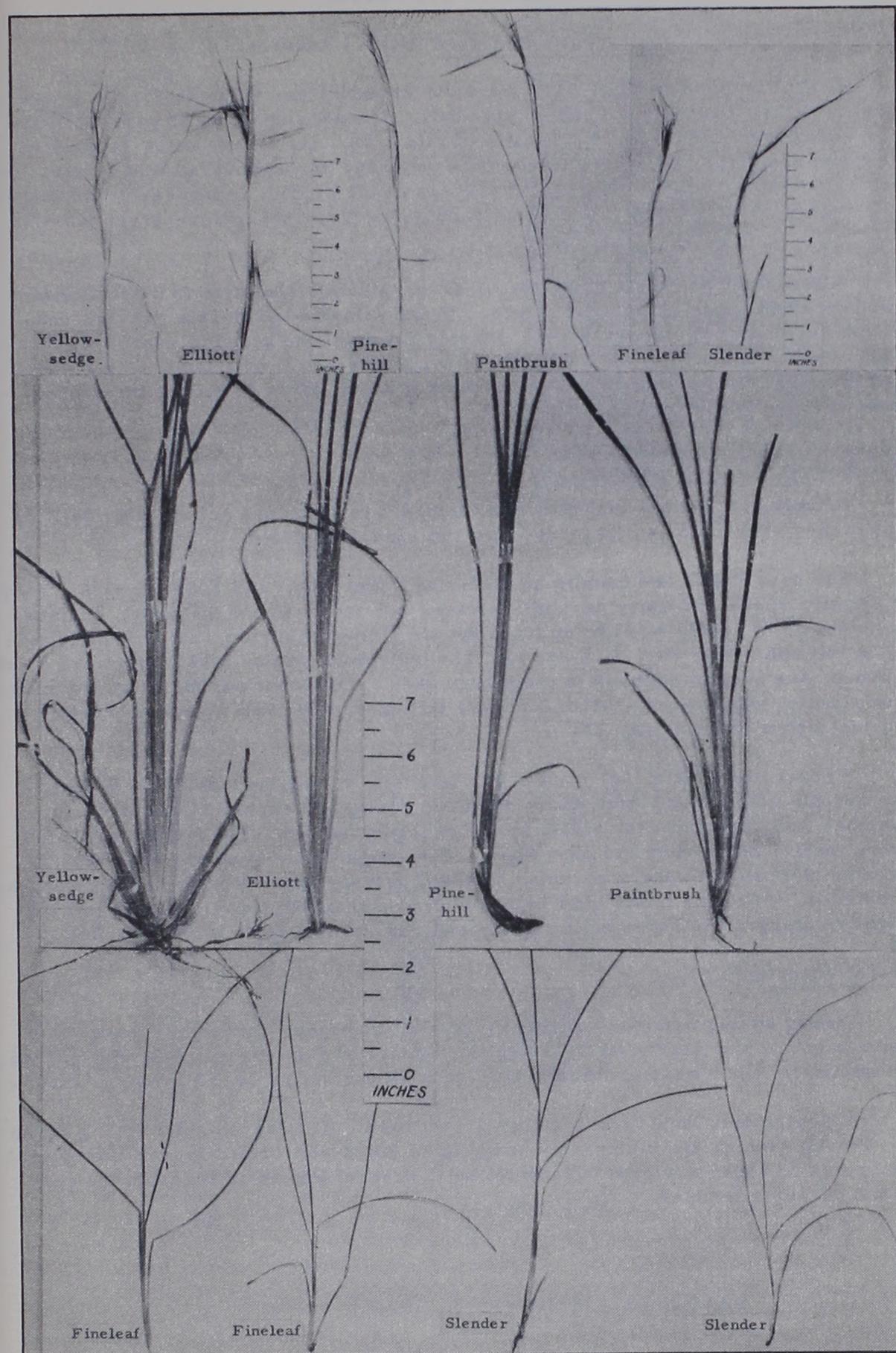


Figure 2. --Flower stalks and basal tufts of bluestem grasses.

Pinehill bluestem

Andropogon divergens (Hack.) Anderss.

Pinehill bluestem (fig. 3) is the most abundant and valuable forage grass in the Louisiana-east Texas longleaf pine belt. It makes up 25 to 35 percent of the cover and forage on most forest ranges of this area. Its forage value is good in spring and summer, and it furnishes edible roughage throughout fall and winter. In central Louisiana, it averages 9 to 13 percent crude protein in the early leaf stage, 7 to 7.5 percent in full leaf, and about 5.25 percent for the mature green plant in fall.

Although it grows on a variety of sites, pinehill bluestem is most abundant on well-drained sandy ridges and slopes. It can withstand moderate grazing and periodic burning, but close, repeated grazing for only one growing season will materially reduce production and kill some of the plants--as it will some of the other bunch grasses. Annual burning, even without grazing, tends to reduce the proportion of this species in the grass stand.

Description

A leafy bunchgrass that grows in clumps 3 to 12 inches across (fig. 3a). In dense stands, the clumps merge and are not clearly defined.

The leaf blades are usually 10 inches to 2 feet long, and 1/4 inch wide. They are slightly rough and hairy on both surfaces but more so on the upper surface. The leaves grow nearly straight up from the old clump in spring, but gradually curl over in fall and winter (fig. 3, a and b). The individual plants, when separated from the bunch, are seen to have six to ten leaves each. The basal portion or sheath cluster is purplish when young, rather slender, flattened, and often makes a quarter twist just above ground (fig. 2b).

Flower stalks (fig. 3c) grow 2 to 5 feet tall, averaging about 3-1/2 feet. They usually stand 2 to 3 feet above the main clump. New stalks shoot up in September and form several small branches near the top. The florets or small flowers mature one by one and blow away. This progressive shedding prohibits the formation of distinct feathery racemes common in many other bluestems--paintbrush, for instance. After the fruits blow away, each branch of the flower stalk is left with a slightly enlarged tip that is hollow or cupped and has few or no hairs (fig. 3d).

Seasonal aspects

During spring and early summer, pinehill bluestem clumps are made up of numerous green and nearly straight leaves, a mass of dead leaves near the ground and sometimes a few weather-beaten blue-gray flower stalks of the previous season.

In September, new flower stalks are formed. The leaves start drying up in fall. During winter, the clumps are made up of faded red-brown leaves that protect a few sprigs of short new growth, and of one to several flower stalks from the current and previous seasons.



FIGURE 3.—PINEHILL BLUESTEM.

Paintbrush bluestem

Andropogon ternarius Michx.

Paintbrush bluestem (fig. 4) is widely distributed, particularly on sandy, well-drained ridges and knolls, and often makes up about 5 percent of the plant cover and forage. The grass is conspicuous in fall and early winter because of the persistent feathery fruits and flower stalk tips (fig. 4, a and f) from which the species gets its name. Paintbrush is not grazed in summer quite so much as other coarse-leaved bluestems because the leaves are very hairy. The hairs are not objectionable to cattle during spring when soft, but are rather stiff in summer and fall.

Description

A leafy, medium-sized bunchgrass that grows in clumps about 2 to 8 inches across (fig. 4a). It is smaller than pinehill bluestem, but the two species resemble each other, especially when flower stalks are not present.

The leaves often have a purplish tinge. The blades are slender, 10 to 15 inches long, 1/8 to 3/16 inch wide, very hairy, and curly when old.

Individual plants (fig. 4b) usually contain 6 to 10 leaves. The basal sheaths are densely covered with velvety hairs, and overlap in a tightly folded, flattened cluster, each sheath having a distinct projecting midrib or keel (fig. 4c).

The flower stalks are upright, slender, 2 to 4 feet tall, and usually have several slender branchlets in the top half (fig. 4d). Young flower stalks have a distinct silvery sheen caused in part by the many long silky hairs on the encircling sheaths.

The maturing spikelets persist for several weeks during late fall within paired or clustered feathery racemes. When these tufted racemes are shed, each branch of the flower stalk is tipped with a small circular fringe of white hairs 3/16 to 1/4 inch long (fig. 4e). These "paintbrushes" are firmly attached and remain on the tip for months, until the stalk weathers away.

Seasonal aspects

In spring and early summer, clumps of paintbrush bluestem are made up of numerous green, hairy leaves, a curly mass of year-old dry leaves, and a few weather-beaten flower stalks.

In fall, the young flower stalks are bluish or purple and have a silky-white sheen on the leaves. The maturing flower stalks have feathery tufts in the upper half. Paintbrush bluestem clumps are easy to pick out if viewed toward the sunlight because the hairs glisten with back-lighting.

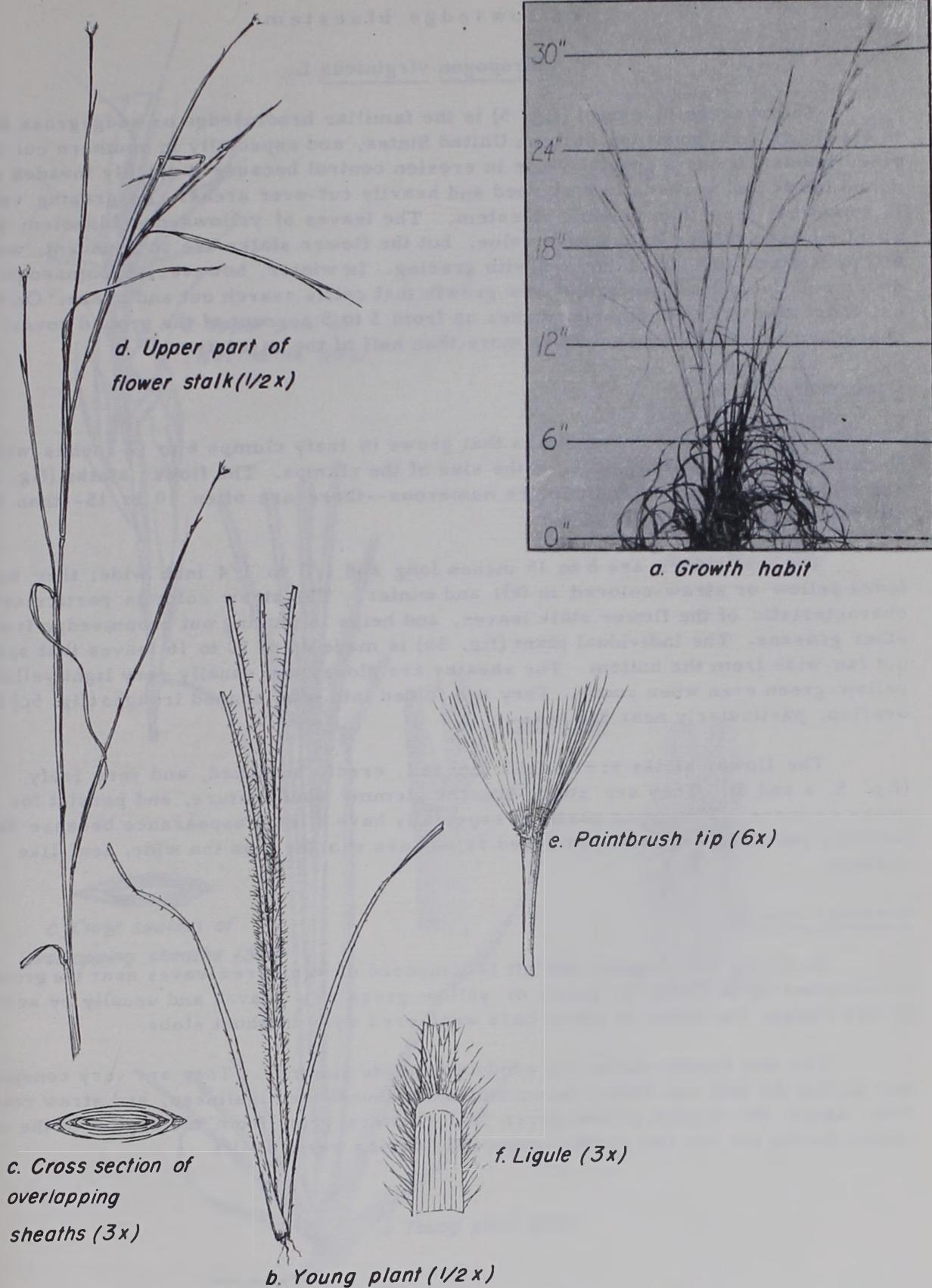


FIGURE 4.—PAINTBRUSH BLUESTEM.

Yellowsedge bluestem

Andropogon virginicus L.

Yellowsedge bluestem (fig. 5) is the familiar broomsedge or sedgegrass found in old fields throughout the eastern United States, and especially in southern cut-over piney woods. It has a special value in erosion control because it quickly invades abandoned fields and spreads to disturbed and heavily cut-over areas. Its grazing value is somewhat less than pinehill bluestem. The leaves of yellowsedge bluestem are about equal to others in nutritive value, but the flower stalks are so abundant, woody, and persistent that they interfere with grazing. In winter, however, broomsedge produces relatively large sprigs of new growth that cattle search out and graze. On forest range this grass ordinarily makes up from 3 to 5 percent of the ground cover. In abandoned fields it may constitute more than half of the vegetation.

Description

A medium-sized bunchgrass that grows in leafy clumps 6 to 12 inches wide. Burning or heavy grazing reduces the size of the clumps. The flower stalks (fig. 5a) are leafy and erect, and much more numerous--there are often 10 to 15--than on other common bluestems.

The leaf blades are 6 to 15 inches long and 1/8 to 1/4 inch wide; they turn faded yellow or straw-colored in fall and winter. The straw color is particularly characteristic of the flower stalk leaves, and helps in picking out broomsedge from other grasses. The individual plant (fig. 5b) is made up of 10 to 16 leaves that spread out fan-wise from the bottom. The sheaths are glossy and usually very light yellow to yellow-green even when young. They are folded into boat-shaped troughs (fig. 5c) that overlap, particularly near the base.

The flower stalks are about 3 feet tall, erect, branched, and very leafy (fig. 5, a and d). They are stout, become stemmy when mature, and persist for 2 years or more. The upper portions especially have a leafy appearance because the feathery racemes are partly enclosed by and are shorter than the wide, leaf-like spathes.

Seasonal aspects

In spring and summer the tuft is composed of weathered leaves near the ground, surmounted by a clump of green or yellow-green new leaves and usually by several flower stalks, the oldest of which have weathered away to short stubs.

The new flower stalks are produced in late summer. They are very conspicuous during the fall and winter because of their abundance, leafiness, and straw color. New, short, fan-shaped, yellow-green leaf clusters grow from the depths of the old clump during the fall and winter, especially during warm spells.

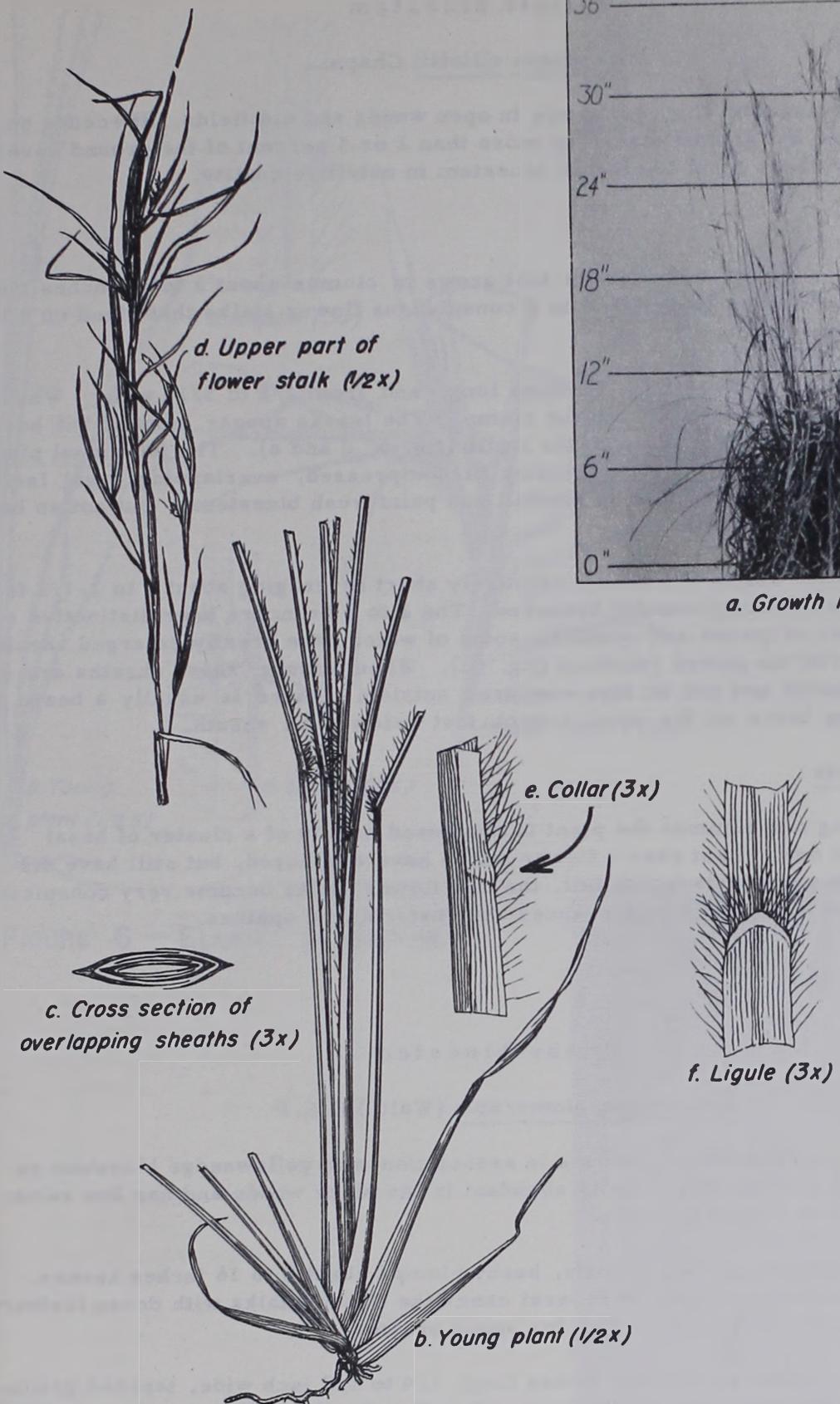


FIGURE 5.—YELLOWSEDGE BLUESTEM.

Elliott bluestem

Andropogon elliottii Chapm.

Elliott bluestem (fig. 6a) grows in open woods and old fields. It occurs on all except wet sites but seldom makes up more than 2 or 3 percent of the ground cover. However, it is about equal to pinehill bluestem in nutritive quality.

Description

A robust, leafy bunchgrass that grows in clumps about 3 to 10 inches wide. The clumps are usually topped by 1 to 6 conspicuous flower stalks that stand up a foot or two above the leaves.

The leaf blades are 6 to 15 inches long, and from 1/8 to 3/16 wide. When mature they curve gracefully from the clump. The leaves appear smooth but have a distinct cluster of hairs just above the ligule (fig. 6, d and e). The individual plant (fig. 6b) has 8 to 16 leaves. The cluster of compressed, overlapping basal leaf sheaths is slightly broader than in pinehill and paintbrush bluestems, but not so broad as in yellowsedge bluestem.

The flower stalks are erect, relatively short (averaging about 2 to 2-1/2 feet), and sparsely and inconspicuously branched. The 2 to 3 branches bear distinctive rust-colored clusters of leaves and spathes, some of which have greatly enlarged sheaths enclosing most of the paired racemes (fig. 6c). When mature, these sheaths are a shiny copper inside and tan or straw-colored outside. There is usually a beard of upward pointing hairs on the stem branch just below each sheath.

Seasonal aspects

In spring and summer the plant is composed mainly of a cluster of basal leaves, old and new. Last year's flower stalks have weathered, but still have distinctive leafy flower clusters. In fall, the new flower stalks become very conspicuous with their large, fan-wise inflorescences and rust-colored spathes.

Bushy bluestem

Andropogon glomeratus (Walt.) B.S.P.

Bushy bluestem (fig. 7) occurs in association with yellowsedge bluestem on low, moist sites. It is not generally abundant in the piney woods and has low value for forage because it is very coarse.

Bushy bluestem grows in leafy, bushy clumps about 8 to 16 inches across. The clumps are usually topped by several cane-like flower stalks with dense, feathery, branching heads that are used locally for small brooms.

The leaf blades are 6 to 24 inches long, 1/4 to 1/2 inch wide, tapered gradually toward the tip, and distinctly narrower than the sheaths. The sheaths are yellow-green, hairy on the edges, folded or boat-shaped, and very broad.

The flower stalks, which are formed in fall, are distinctly jointed, about 3/16 inch in diameter, and usually 3 to 5 feet tall. They branch near the top. Most of the fruits are shed by late winter.

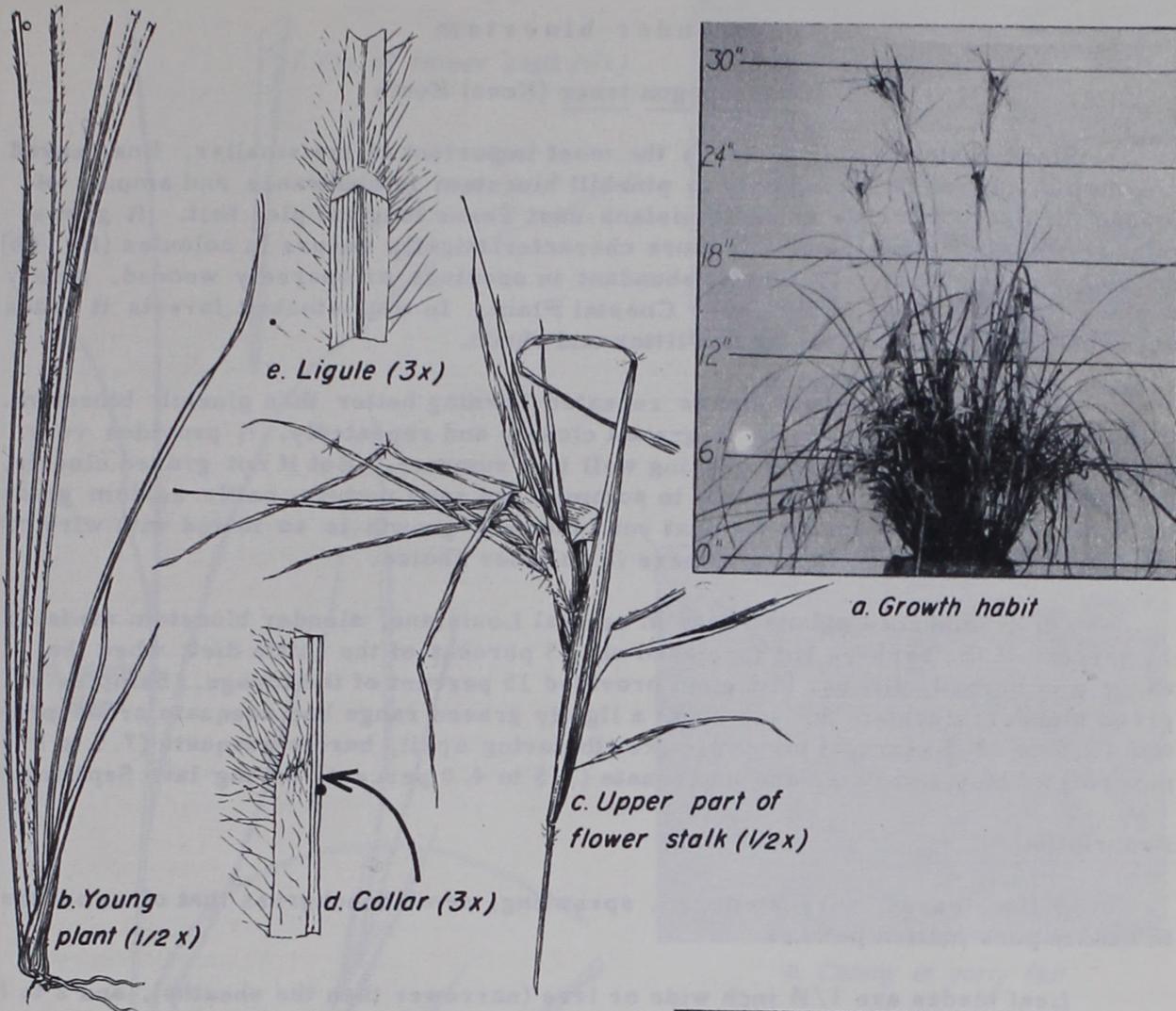


FIGURE 6.—ELLIOTT BLUESTEM.



FIGURE 7.—BUSHY BLUESTEM

Slender bluestem

Andropogon tener (Nees) Kunth

Slender bluestem (fig. 8a) is the most important of the smaller, fine-leaved bluestems. It ranks second only to pinehill bluestem in abundance and amount of forage furnished to cattle in the Louisiana-east Texas longleaf pine belt. It grows mixed with other bluestems, but more characteristically occurs in colonies (fig. 8b) of nearly pure stands. It is most abundant in openings or sparsely wooded, poorly drained flatwood areas of the lower Coastal Plain. In well-stocked forests it fades out because it is smothered by leaf litter and shade.

Slender bluestem withstands repeated burning better than pinehill bluestem. If the new growth after burning is grazed closely and repeatedly, it provides very good forage in spring and fair grazing well into summer. But if not grazed closely, the plants form flower stalks early in summer and soon mature; cattle seldom graze the mature plant, and during the next year the new growth is so mixed with wiry old growth that cattle graze it only if there is no other choice.

On an unburned upland range in central Louisiana, slender bluestem made up 15 percent of the herbage but furnished only 3 percent of the cattle diet; when the range was burned, slender bluestem provided 15 percent of the forage. Samples of green slender bluestem foliage from a lightly grazed range had adequate crude protein (9.5 to 13.3 percent) for cattle growth during April, barely adequate (7.5 to 8.3 percent) in May and June, and inadequate (3.5 to 4.0 percent) during late September.

Description

A fine-leaved, wiry-stemmed, sprawling, semi-bunchgrass that often occurs in nearly pure matted patches.

Leaf blades are 1/16 inch wide or less (narrower than the sheaths), and 2 to 8 inches long. The individual plant is small, with 4 to 8 leaves (fig. 8c). The basal sheath cluster is rounded, rather than flattened as in fineleaf and other bluestems.

The flower stalks are slender, wiry, mostly reclining, and 1 to 3 feet long. Their zigzag appearance results from a bend at each swollen knee-shaped node (fig. 8d). The flower stalks produce several slender branches on which single, straight, spike-like racemes are borne. When mature the entire raceme with its inconspicuous fruits is shed quickly, leaving a tiny hollow oblique tip on each flowerstalk branch (fig. 8f).

Seasonal aspects

In spring new growth is mixed in with last season's stems, which branch at some nodes to produce new shoots. If the previous year's growth is removed by burning or close grazing, the new growth appears in small dense tufts. These produce flower stalks by midsummer if not grazed.

In fall and winter, slender bluestem is in matted, tangled, irregular patches (fig. 8b) the color of faded straw.

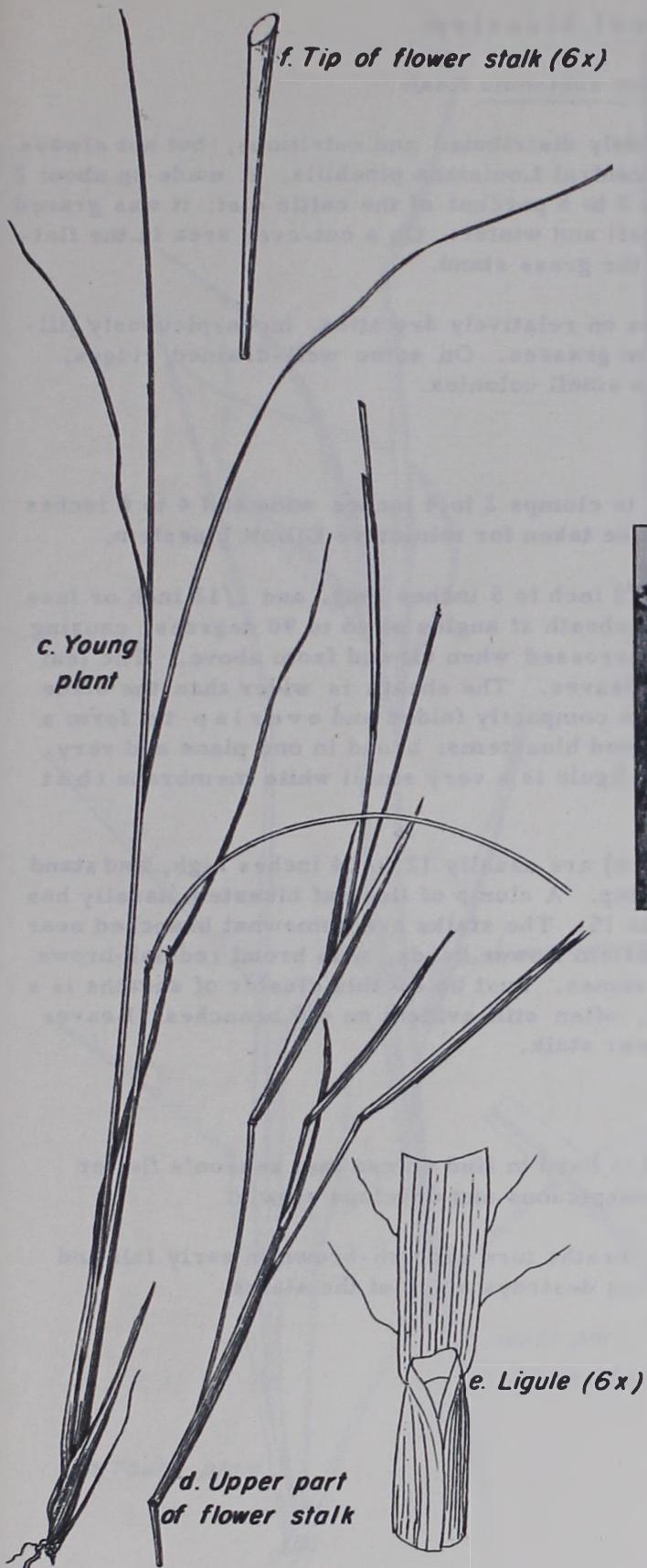


FIGURE 8.—SLENDER BLUESTEM.

Fineleaf bluestem

Andropogon subtenuis Nash

Fineleaf bluestem (fig. 9) is widely distributed and nutritious, but not always abundant. On one forest range in the central Louisiana pinehills, it made up about 2 percent of the ground cover, and from 3 to 6 percent of the cattle diet; it was grazed more closely than other bluestems in fall and winter. On a cut-over area in the flatwoods, it made up about 25 percent of the grass stand.

Fineleaf bluestem usually grows on relatively dry sites, inconspicuously filling in between clumps of other bluestem grasses. On some well-drained ridges, mounds, and slopes, it may be found in small colonies.

Description

A small bunchgrass that grows in clumps 2 to 4 inches wide and 4 to 6 inches high (fig. 9a). At first glance it might be taken for miniature Elliott bluestem.

The blades of the leaves are 1/2 inch to 8 inches long, and 1/12 inch or less in width. They project stiffly from the sheath at angles of 45 to 90 degrees, causing the leaves in a clump to appear crisscrossed when viewed from above. The leaf cluster (fig. 9b) is composed of 4 to 6 leaves. The sheath is wider than the blade (fig. 9, d and e). The basal sheaths are compactly folded and overlap to form a sheath cluster typical of the coarse-leaved bluestems: broad in one plane and very thin and compressed in the other. The ligule is a very small white membrane that looks like a pointed tongue.

The flower stalks (fig. 9, a and c) are usually 12 to 24 inches high, and stand erect 6 to 12 inches above the leafy clump. A clump of fineleaf bluestem usually has 1 to 3 flower stalks, but may have 10 to 15. The stalks are somewhat branched near the top and resemble small Elliott bluestem flower heads, with broad reddish-brown sheaths clustered at the base of the racemes. Just below this cluster of sheaths is a sparse beard of upward pointing hairs, often still evident on old branches. Leaves are scarce on the lower half of the flower stalk.

Seasonal aspects

In spring and summer the plant is hard to find unless last season's flower stalks remain. The new growth is inconspicuous and develops slowly.

The leaves and enlarged floral sheaths turn reddish-brown in early fall and remain so during winter. Winter grazing destroys many of the stalks.

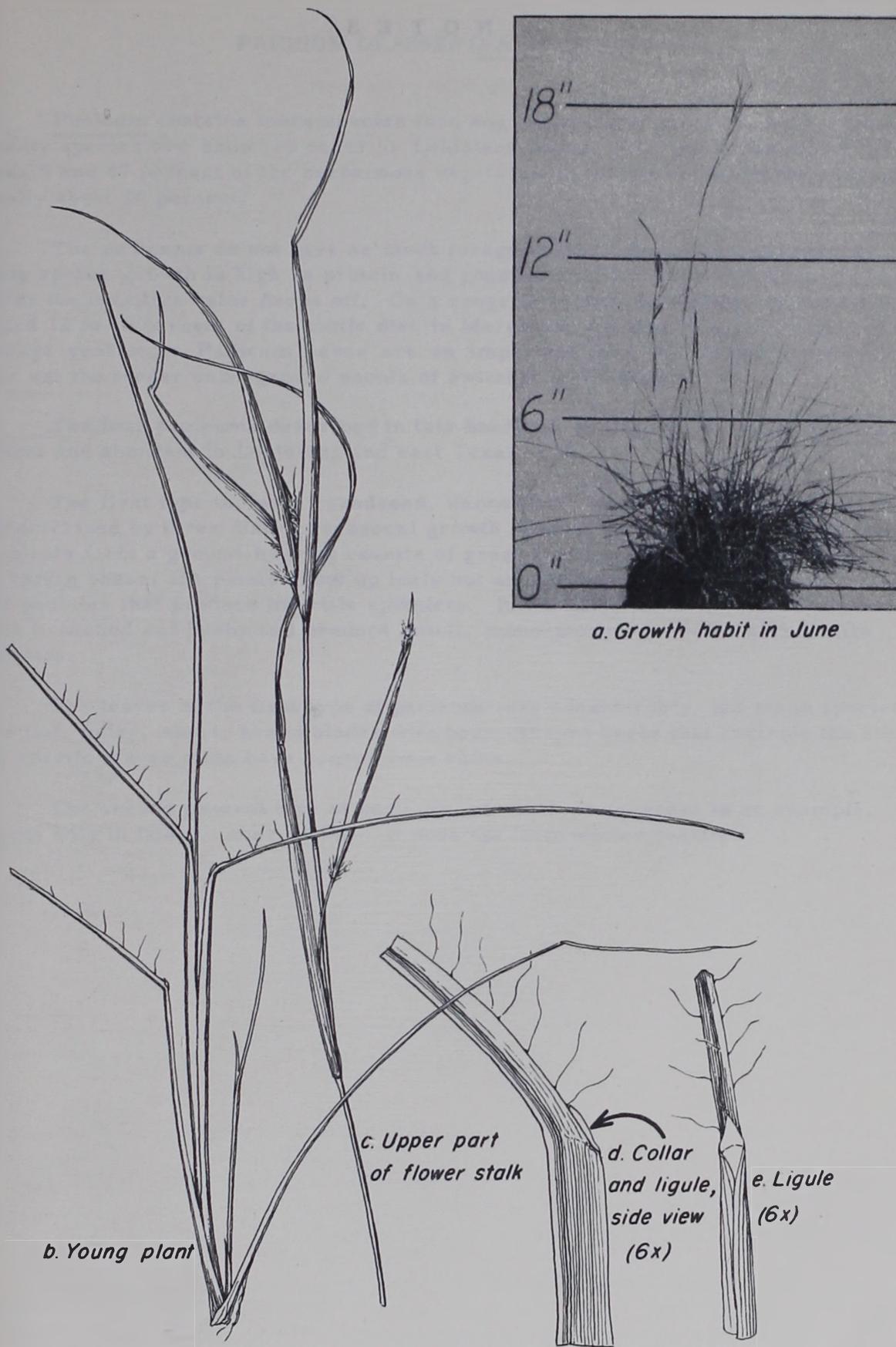


FIGURE 9.—FINELEAF BLUESTEM

N O T E S

PANICUM GRASSES (PANICUM SPP.)

Panicum contains more species than any other grass genus on earth. Nearly seventy species are known to occur in Louisiana alone. The panicums make up between 5 and 40 percent of the herbaceous vegetation in the piney woods; the average is usually about 10 percent.

The panicums do not have as much forage value as the bluestem grasses. The young spring growth is high in protein and phosphorus, but when the plants begin to flower the nutritive value drops off. On a range in central Louisiana, panicums furnished 12 to 16 percent of the cattle diet in March and April but only 5 percent of the average yearlong. Panicum seeds are an important food for upland game birds. Deer eat the tender underground shoots of switchgrass in winter.

The four panicums described in this handbook represent two types that are important and abundant in Louisiana and east Texas.

The first type includes roundseed, narrowleaf, and woolly panicums. It is characterized by three distinct seasonal growth phases. The winter phase, in which the plants form a ground-hugging rosette of green leaves, is the most distinctive. In the spring phase, the plants shoot up leafy but unbranched flower stalks with prominent panicles that produce infertile spikelets. In the fall phase, the flower stalks become branched and bushy and produce small, inconspicuous panicles with fertile spikelets.

The leaves of the first type of Panicum vary considerably, but many species have flat, hairy, short, broad blades with heart-shaped bases that encircle the stem. The rosette leaves often have conspicuous veins.

The second general type of Panicum, of which switchgrass is an example, blooms only in late summer or fall. It does not form winter rosettes.

Roundseed panicum

Panicum sphaerocarpon Ell.

Roundseed panicum (fig. 10) is scattered throughout the piney woods in small clumps closely associated with the bluestems. Though widely distributed, it makes up about one percent or less of the ground cover and cattle diet. Roundseed panicum is good-quality forage in late winter and early spring but is not grazed much after flower stalks are produced--about May 15. When range is burned, especially in February and early March, the leaves of roundseed panicum remain green for at least a few days even when nearly all other herbaceous vegetation and litter has been burned up. Cattle and sheep move promptly onto burned areas, even while the pine stumps are still smoking, and graze these rosettes.

Description

Roundseed panicum is distinctive and often conspicuous because of its peculiar fall and winter rosettes. It grows in small, single, easily uprooted tufts and has three seasonal forms: the spring flowering phase (fig. 10a), the autumnal phase (fig. 10b), and the winter rosette (fig. 10f).

Leaf blades are light green with a white membranous margin, thick, and distinctly veined, and glabrous except for a few hairs on leaf margins near the base. The blades taper gradually from the heart-shaped, clasping base to the acute tip. They are 1 to 5 inches long and 1/2 inch wide (fig. 10e). There is no ligule (fig. 10c), except that one variety (*P. sphaerocarpon* var. *inflatum*) has a fringe of short hairs for the ligule (fig. 10d). Rosette sheaths are very short and overlap. The sheaths on flower stems closely encircle the stem: they are glossy and have no hairs except on the margin.

Normal flower stalks, which shoot up in May to heights of 10 to 24 inches, are glabrous and have few leaves. They stand erect or lean slightly. The stem is topped by a loose, finely divided panicle, almost conical in shape, 2 to 5 inches long and nearly as wide. The panicle is purplish-green when young. Each small branchlet is tipped with a single, rounded, dark purple spikelet (fig. 10g). The fruits are smooth and china-white when mature; they gradually shed during summer.

Seasonal aspects

In spring new leaves and a tall flower stalk are produced from the winter rosette. After the rosette dries up, usually in May, the plant is composed mainly of the flower stem with its leaves and panicle.

In summer the spring flower stalk dries up and in fall new leaves form at its base. These fall leaves form a modified rosette or branch loosely and spread along the ground a few inches (fig. 10b). Short, leafy flower stalks, 4 to 5 inches high, are produced in October from the lower and middle nodes. Some of these partly enclose a panicle that is rather reduced but produces fruits.

In winter the fall flower stalks dry up and new deep green rosettes are produced during warm spells from January to March. These hug the ground, are often in the protection of old litter, and are characterized by very short, broad, thick, glossy leaves.

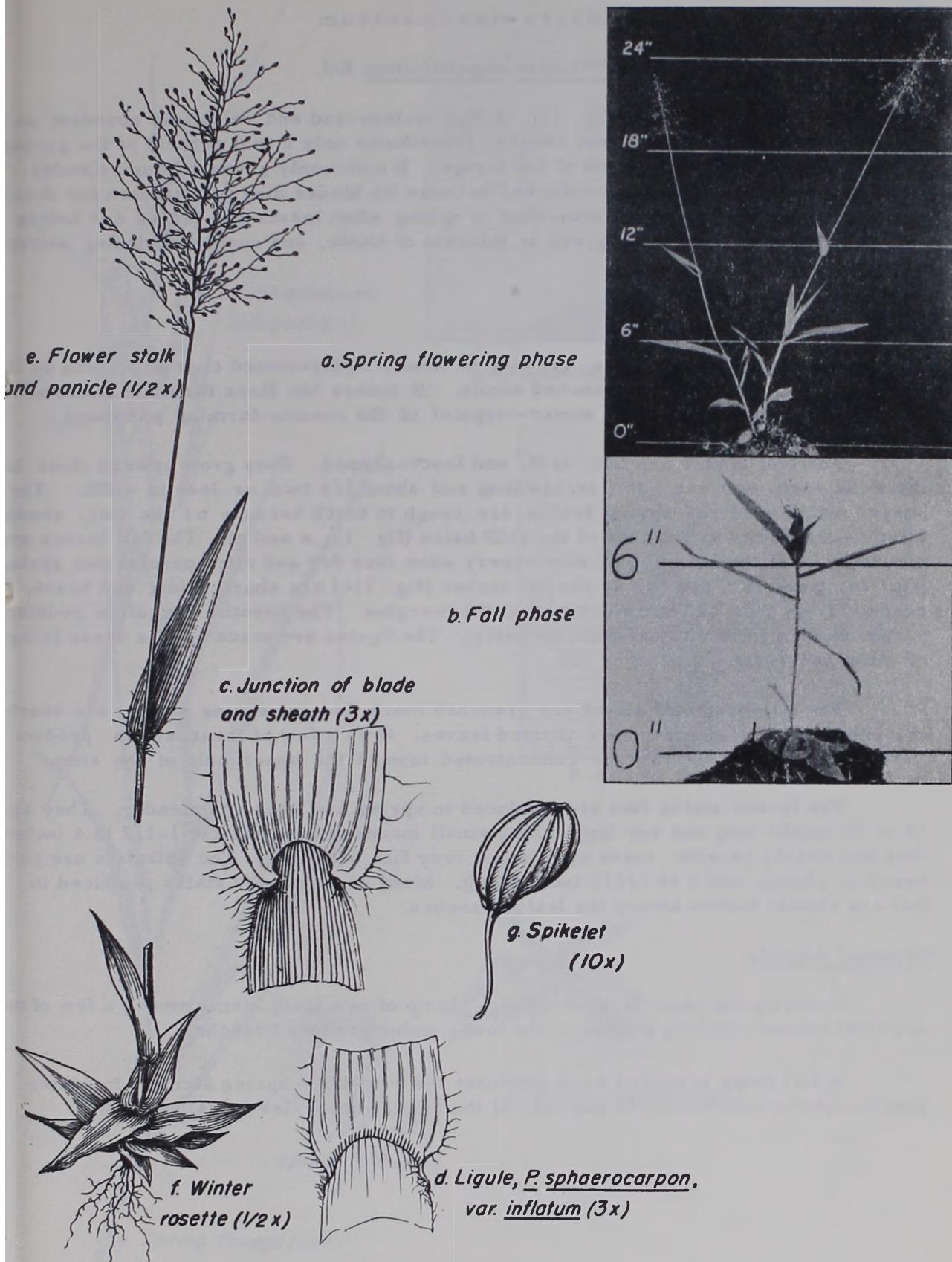


FIGURE 10.—ROUNDSSEED PANICUM.

Narrowleaf panicum

Panicum angustifolium Ell.

Narrowleaf panicum (fig. 11), though widespread and relatively abundant on the cut-over longleaf pine forest ranges, contributes only 2 to 4 percent of the ground cover and less than one percent of the forage. It commonly grows through slender bluestem mats and is easily overlooked because its blades may be mistaken for those of bluestem. Cattle graze it somewhat in spring when leaves are tender and before flower stalks develop. This grass is tolerant of shade, and survives burning better than many other grasses.

Description

An inconspicuous grass, growing in loose, finely-rooted clumps formed by 10 to 20 slender, weak, leafy branched stems. It makes the three forms of seasonal growth--in spring, fall, and winter--typical of the rosette-forming panicums.

The leaf blades are flat, stiff, and lance-shaped. They grow upward close to the weak stem and are 3 to 6 inches long and about 1/4 inch or less in width. The lower surfaces of the spring leaves are rough to touch because of the tiny, sharp blister-like points at the base of the stiff hairs (fig. 11, a and e). The fall leaves are glabrous, stiff, and thin; they turn papery when they dry and often persist into spring (fig. 11, b and f). The winter rosette leaves (fig. 11c) are short, wide, and heart-shaped at the base and hairy-fringed on the margins. The sheaths are often reddish-purple and rough to touch (papillose-hairy). The ligules are made up of a dense fringe of white hairs (fig. 11d).

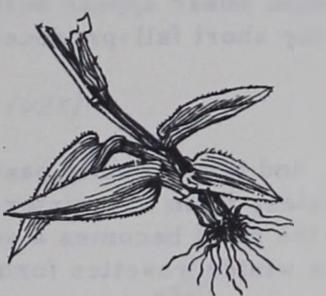
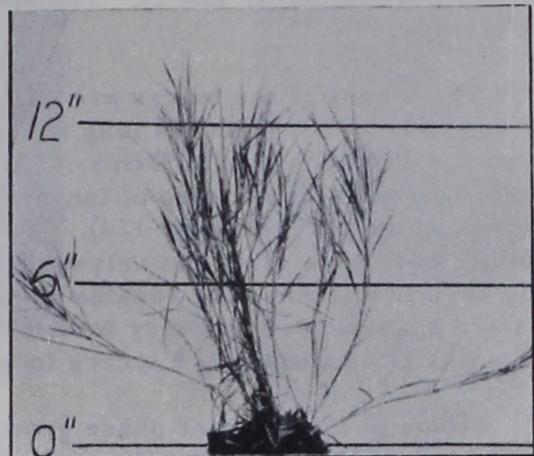
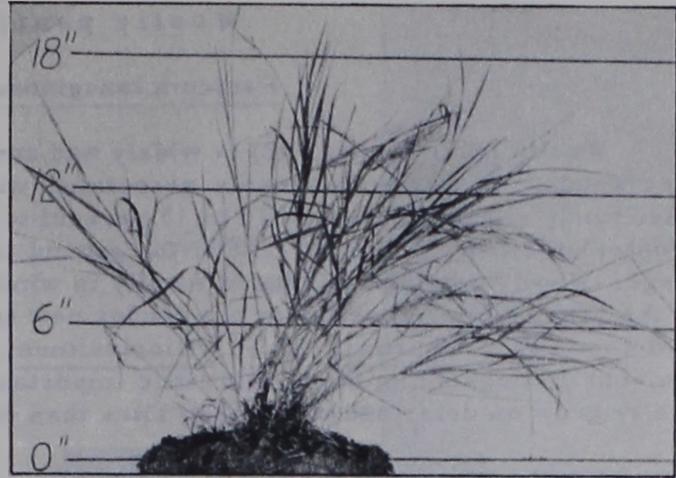
The fall-produced stems are branched more than the spring stems, are shorter, and bear smaller and more pointed leaves. Only a few of these stems produce flower stalks. The leaves are concentrated toward the upper half of the stem.

The flower stalks that are produced in spring are weak and slender. They are 15 to 30 inches long and are topped by a small inconspicuous panicle 1-1/2 to 4 inches long and nearly as wide, made up of a few very fine branches. The spikelets are pubescent, plump, and 1 to 1-1/8 inches long. Many of the flower stalks produced in fall are almost hidden among the leafy branches.

Seasonal aspects

In spring the plant is made up of a clump of new leafy stems among a few of the dead fall stems. During summer, the lower nodes produce branches.

In fall these branches soon dominate the weathered spring stems. In winter small rosettes are formed at the base of the dead, papery-leaved fall growth.



e. Spring foliage ($1/2x$)

FIGURE II.—NARROWLEAF PANICUM.

Woolly panicum

Panicum lanuginosum Ell.

Woolly panicum (fig. 12) is widely and consistently distributed throughout the piney woods. It usually is closely associated with the bluestem grasses. On some moist sandy sites it makes up 10 to 15 percent of the stand, but on the average range it contributes from 2 to 5 percent of the ground cover and less than one percent of the forage. Woolly panicum is grazed mostly in winter and early spring, since cattle prefer the green winter rosettes or the tender new spring growth. Two very closely related species, *P. thurrowii* and *P. villosissimum*, are easily mistaken for woolly panicum, but distinguishing them is of little importance in grazing management. They usually grow on drier and more open sites than woolly panicum.

Description

A woolly grass that grows in 3 seasonal forms typical of the rosette-forming panicums (fig. 12, a, b, and c). The spring and fall forms are in medium-sized, loose clumps.

The blades of the leaves are densely hairy, and hence look thick (fig. 12d). They are usually 2 to 4 inches long and about 1/4 to 1/2 inch wide, but the dimensions vary on the different growth forms. The sheaths and ligules are also hairy. There is often a distinct denser ring of longer hairs at the node and a hairless ring on the stem just below the node (fig. 12d). The rosette leaves (fig. 12e) are short and wide, smooth on the upper side, but velvety below. The flower stalks that are produced in spring have few leaves, the sheaths are shorter than the stem joints, and the lower nodes are knee-shaped and vary in height from 12 to 24 inches. The hairy panicle, on the main axis, is from 2 to 5 inches long and about as wide.

Stems of the summer phase grow from the middle nodes of the spring stems. They appear in June after the flowers mature, range from 8 to 12 inches high, and are covered with hairy sheaths (fig. 12g). These stems are branched, and have clusters of leaves at the nodes.

Stems of the autumnal phase appear bushy, with clusters of densely bearded leaves intermingled with the short fall-produced panicles.

Seasonal aspects

In March, April, and May, woolly panicum produces several slender flower stalks, with distinct panicles, from the winter rosette. In early summer, the leafy vernal stems branch and the plant becomes a velvety gray-green clump. In fall, the clump is more open. The winter rosettes form at the base of the clump of the fall-produced leafy stems.

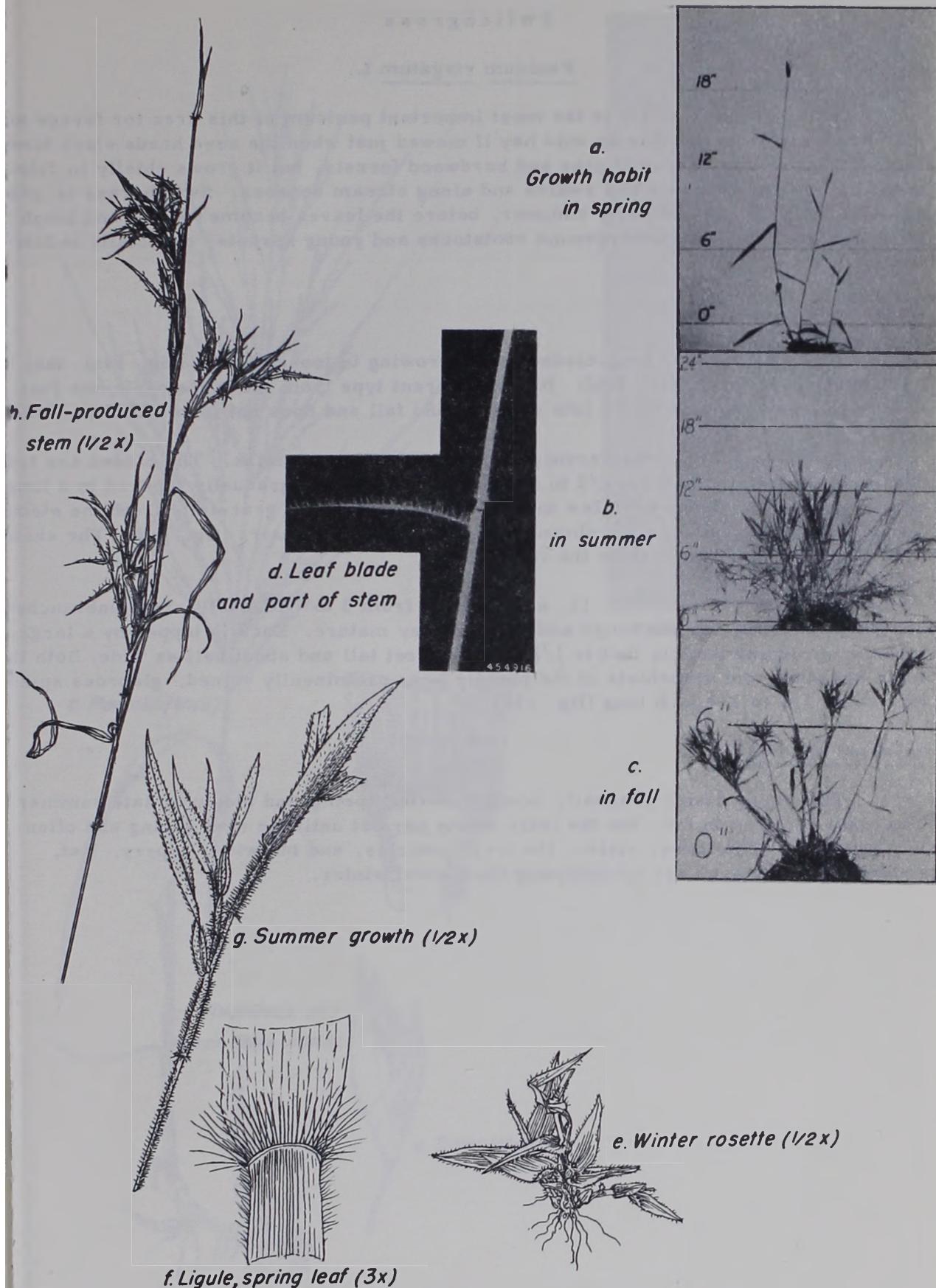


FIGURE 12.—WOOLLY PANICUM

Switchgrass

Panicum virgatum L.

Switchgrass (fig. 13) is the most important panicum of this area for forage and also has considerable value as wild hay if mowed just when the seed heads start forming. Small colonies occur in pine and hardwood forests, but it grows chiefly in fair-sized patches in meadows and swales and along stream courses. Switchgrass is grazed principally in spring and early summer, before the leaves become coarse and tough. Deer dig up and eat the underground rootstocks and young sprouts, especially in late winter.

Description

A large, coarse, long-bladed grass growing in loose clumps (fig. 13a) that have scaly rootstocks (fig. 13b). It is a different type from the three panicums just discussed, as it blooms in the late summer and fall and does not form basal rosettes.

The leaves are rather evenly spaced on the flower stalks. The blades are from 1/2 to 3-1/2 feet long, from 1/2 to 3/4 inch wide, flat, and gradually tapered to a long-pointed rough tip. They have few to many hairs, and curve gracefully from the stem. The ligule is a wavy white membrane with a fringe of long hairs (fig. 13d). The sheath are round and closely encircle the round stem.

The flower stalks (fig. 13, a and c) are from 3 to 7 feet tall, erect, unbranched, and purplish; they become tough and hard as they mature. Each is topped by a large, loosely spreading panicle that is 1/2 to 1-1/2 feet tall and about half as wide. Both the main branches and branchlets of the panicle bear prominently veined, glabrous spikelets about 1/8 to 1/4 inch long (fig. 13e).

Seasonal aspects

The young stems gradually develop during spring and bloom in late summer. The plant dries up in fall, but the leafy stems persist until the next spring and often into summer. The flower stalks, the large panicles, and the wide, papery, flat, reddish-brown leaves are conspicuous throughout winter.

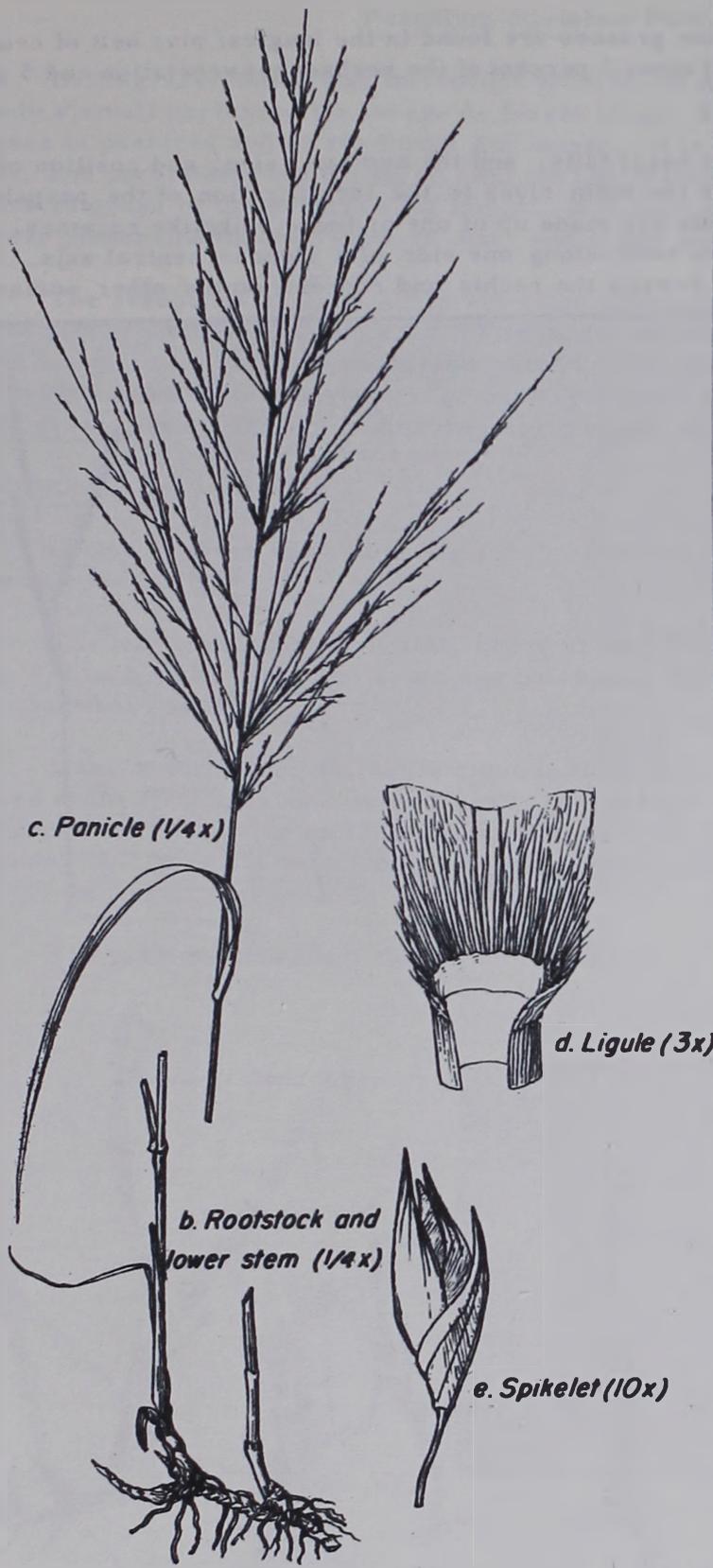


FIGURE 13.—SWITCHGRASS.

PASPALUM GRASSES (PASPALUM SPP.)

Five important paspalum grasses are found in the longleaf pine belt of central Louisiana. Here they make up about 2 percent of the herbaceous vegetation and 5 percent of the cattle diet.

The growth habit of the basal tufts, and the number, size, and position of the racemes in the seedheads are the main clues to the identification of the paspalums (fig. 14). In general, seedheads are made up of one or more spikelike racemes, with the spikelets crowded into two rows along one side of a slender central axis. The spikelets are flat on the side toward the rachis and rounded on the other surface.



Figure 14. —Seed heads and basal tufts of paspalum grasses.

Dallisgrass

Paspalum dilatatum Poir.

Dallisgrass, which was introduced from South America in about 1850, makes up only a small portion of the forage on forest range, but is one of the predominant grasses in pastures and on roadsides and levees. It is very nutritious, productive, hardy, and persistent; and for these reasons has become the most popular perennial cultivated grass in the western Gulf States. It is also planted for erosion control on highway embankments and rights-of-way, and it has been seeded on forest firebreaks.

The seedheads of Dallisgrass are often attacked by ergot, a dark-gray powdery fungus that appears on the spikelets. The fungus reduces the viability of the seeds and partly accounts for the commonly experienced difficulty in establishing good stands. The ergot-infested seeds contain ergotoxine, which is poisonous to livestock. When cattle graze diseased plants, numerous death losses may occur.

Description

Grows in dense leafy tufts (fig. 15a). Under heavy grazing or mowing it becomes almost turflike.

The leaf blades are thin, flat, broad at base, lance-shaped, 4 to 10 inches long, 1/2 inch wide, and often rough and hairy near the base. The sheath is keeled and somewhat flattened.

Many of the flower stalks lie close to the ground for a few inches and then turn upward at the first knee-shaped node; very few of them stand erect. The flower stalks are topped with 3 to 6 (up to 11) racemes that are 2 to 4 inches long (fig. 15b) and tend to droop. The spikelets have long silky hairs on the margins (fig. 15c) and are about 1/8 inch in length.

The plant blooms from early summer to fall.

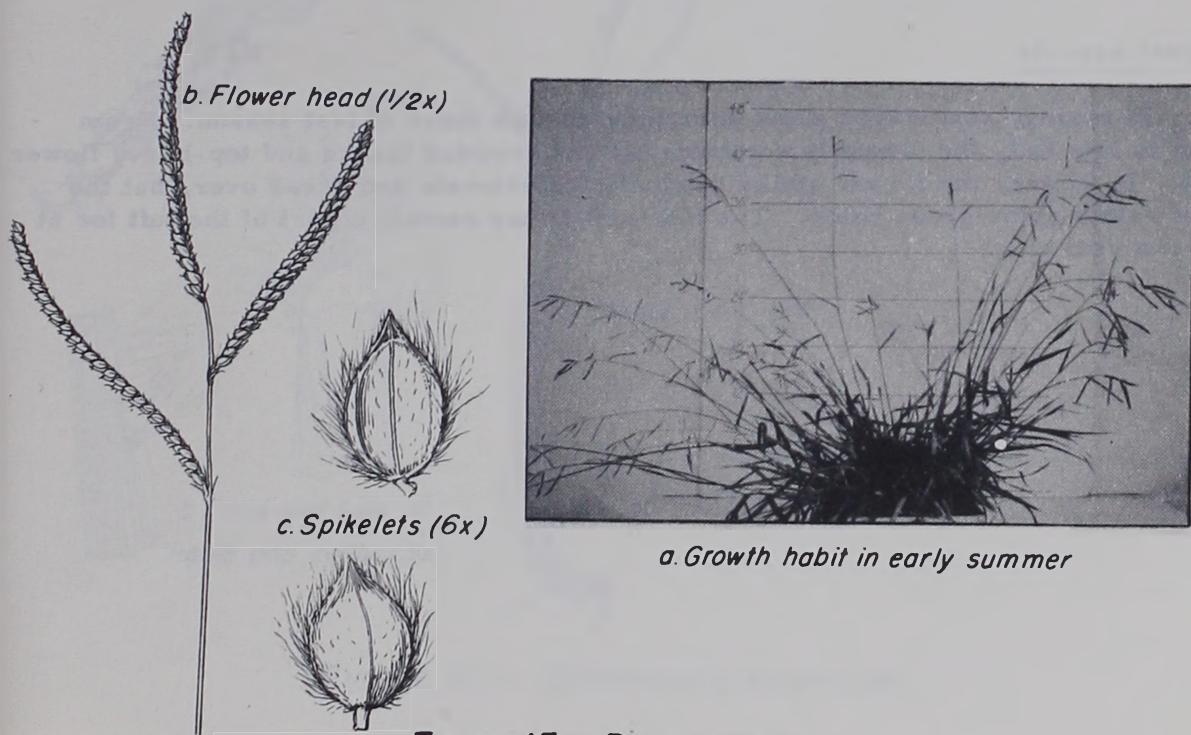


FIGURE 15.—DALLISGRASS

Brownseed paspalum

Paspalum plicatum Michx.

Brownseed paspalum--sometimes called blue paspalum--grows in patches or dense clumps along roadsides and in borrow pits, swales, meadows, and intermittent stream courses. It is widely distributed. It sometimes occurs in fairly large colonies, and the fact that it grows most abundantly along roads appears to be a sign that it spreads into disturbed areas. It makes up about 1 percent of the herbaceous vegetation and contributes 2 to 3 percent of the cattle diet on yearlong ranges in central Louisiana. Cattle graze it mostly from July to February because the leaves remain partly green during fall and winter when most other grasses dry up.

Description

Grows in medium-sized clumps, with numerous leafy shoots below, from a rhizome-like knotty base (figs. 14 and 16, a and b).

The leaves are crowded in the clump. The blades are slender, pointed, 6 to 24 inches long, about 3/16 inch wide, stiff and tough, mostly glabrous, and usually bluish-green. The sheaths are boat-shaped or keeled but not strongly folded together; they are mostly glabrous. The ligules are brownish translucent membranes that extend down the sheath. There is usually a distinct grouping of long hairs just above the ligule (fig. 16, b and c).

The stems are 1-1/2 to 3 feet tall, purple to blue-green in color (hence the name blue paspalum), glabrous-waxy, slender, knee-shaped at base, and usually top-heavy or bent over by 3 to 10 or more racemes (fig. 16, d and e). The upper halves of the stalks have few or no leaves. Stems and racemes are produced during most of the growing season. The racemes are 1 to 4 inches long and have 2 meshed rows of spikelets crowded to one side of the rachis. There is a tuft of long hairs where the rachis joins the main stalk (fig. 16d). The spikelets (fig. 16, f and g) are typically flat on one face and rounded on the other. The fruits, inside the spikelets, are dark-brown and shiny.

Seasonal aspects

In spring, new leaves grow intermingled with those of last season. From spring to late fall, the clump is a combination of crowded leaves and top-heavy flower stalks. In winter, the flower stalks gradually deteriorate and break over, but the leaves retain some green color. The old leaves may remain a part of the tuft for at least two years.

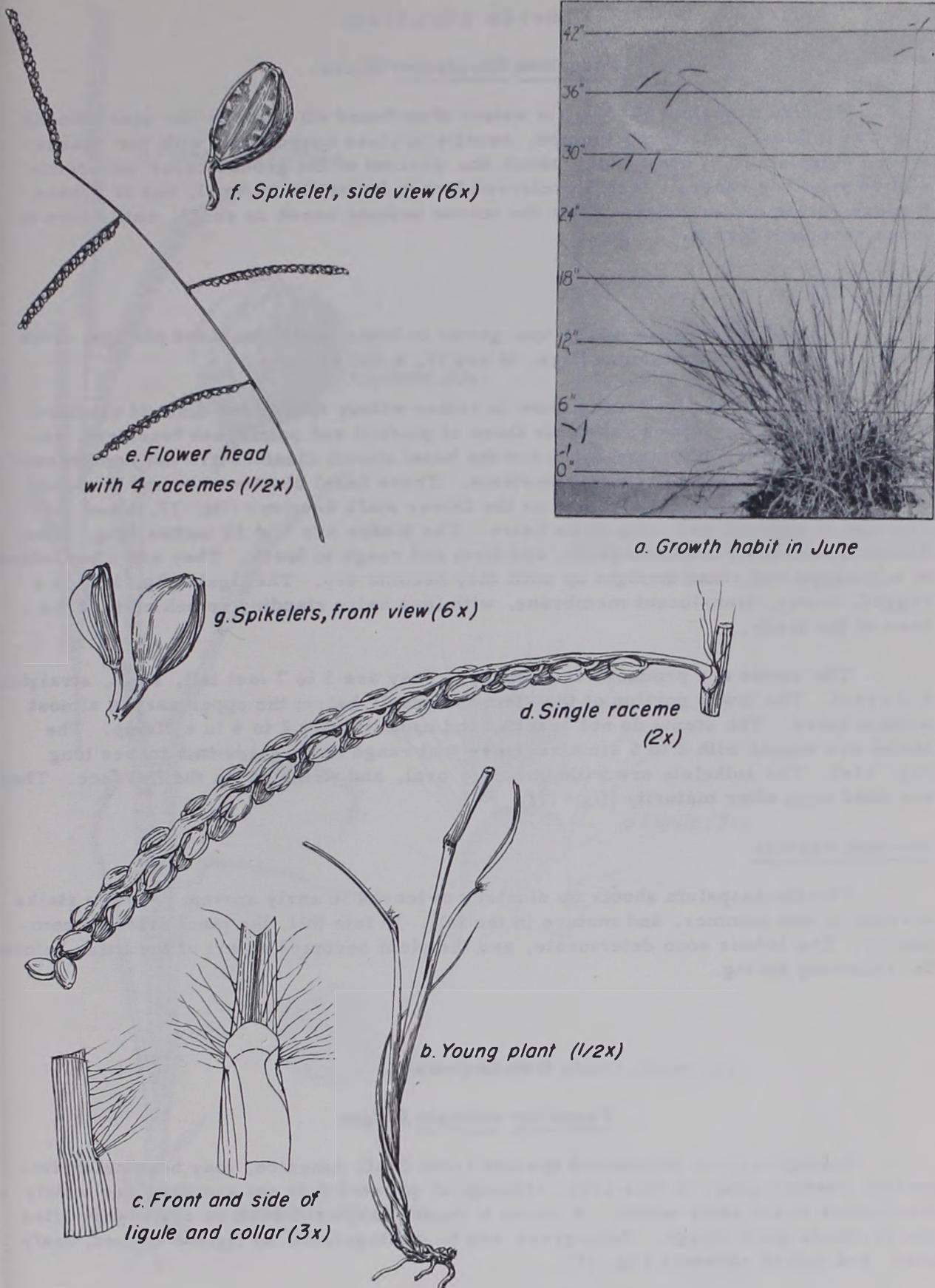


FIGURE 16.—BROWNSEED PASPALUM.

Florida paspalum

Paspalum floridanum Michx.

Florida paspalum (fig. 17) is widely distributed all through the piney woods. It grows in loose, scattered clumps, usually in close association with the coarse-leaved bluestems. It contributes about one percent of the ground cover and cattle diet on yearlong ranges. It is a preferred forage for cattle in April, and is grazed through spring and summer. After the leaves become harsh or rough, cattle turn to more succulent forage.

Description

A moderately large grass that grows in loose, medium-sized clumps, from large, pointed, scaly rhizomes (figs. 14 and 17, a and b).

In the clumps, the leaves grow in rather widely spaced but distinct clusters. In early spring, the leaves resemble those of pinehill and paintbrush bluestem, except that the blades are more erect and the basal sheath clusters are not compressed or flattened as much as in these bluestems. These basal clusters become thick and rounded in late spring and summer as the flower stalk develops (fig. 17, b and c). The leaf is covered with long white hairs. The blades are 6 to 20 inches long, often 1/2 inch broad, tapered to a point, and firm and rough to touch. They are often folded to a V-shape and stand straight up until they become dry. The ligule (fig. 17d) is a ragged, brown, translucent membrane, with long hairs standing up behind it at the base of the blade.

The stems are produced in summer. They are 3 to 7 feet tall, stout, straight, and erect. The lower portion of the stem is densely hairy; the upper part is almost without hairs. The stems do not branch, and usually grow 2 to 4 in a clump. The stalks are topped with 2 to 5 stout racemes that range from 1-1/2 to 5 inches long (fig. 17e). The spikelets are without hairs, oval, and wrinkled on the flat face. They are shed soon after maturity (fig. 17f).

Seasonal aspects

Florida paspalum shoots up clusters of leaves in early spring. Flower stalks develop in late summer, and mature in the fall. In late fall, the plant dries up completely. The leaves soon deteriorate, and the plant becomes a part of the litter before the following spring.

Bahiagrass

Paspalum notatum Flügge

Bahiagrass, an introduced species from South America, may become an important pasture grass in this area, although at present it is not abundant nor widely distributed in the piney woods. It forms a dense, tough sod even on dry, sandy sites and produces good forage. Bahiagrass can be distinguished by its fan-shaped, leafy base and paired racemes (fig. 14).

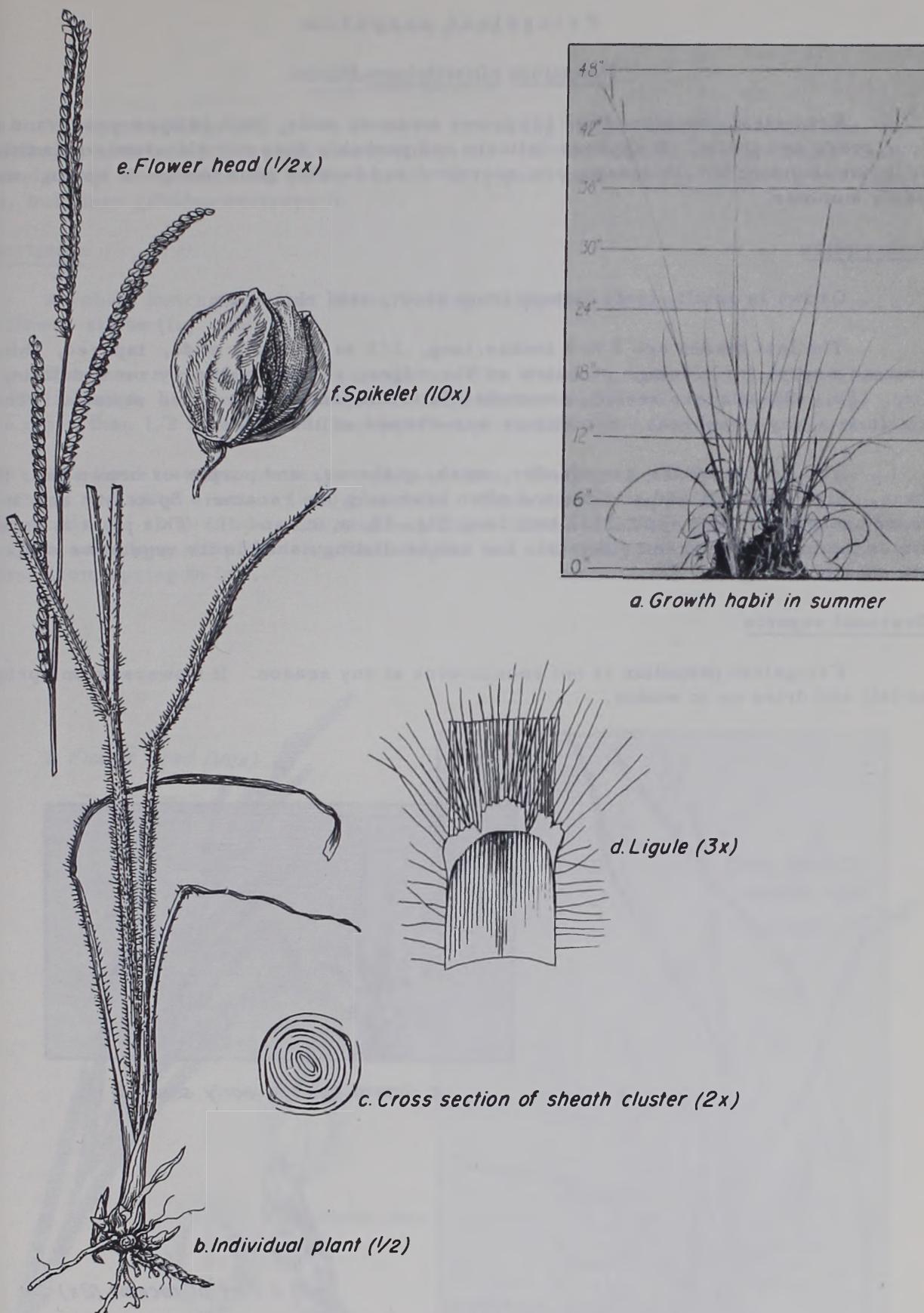


FIGURE 17.—FLORIDA PASPALUM.

Fringeleaf paspalum

Paspalum ciliatifolium Michx.

Fringeleaf paspalum (fig. 18) grows on sandy soils, both in open woods and along roads and trails. It appears delicate and probably does not withstand competition. It is not abundant but the leaves are succulent and furnish good forage in spring and early summer.

Description

Grows in small, leafy clumps from short, stiff rhizomes.

The leaf blades are 2 to 8 inches long, $1/3$ to $1/2$ inch wide, tapered, thin, smooth except for a fringe of hairs on the edges, and twisted-wavy or undulating (fig. 18b). Sheaths are keeled, somewhat flattened, and not crowded at base. The ligule is a tiny membrane, sometimes ear-shaped at the sides.

The flower stalks are slender, weak, glabrous, and purple or brown near the base. They are long and slender and often bear only one raceme. Spikelets are minutely pubescent, and about $3/32$ inch long (fig. 18, a, c, and d). This plant is sometimes confused with green silky-scale but can be distinguished in its vegetative stage by its sheath and ligule.

Seasonal aspects

Fringeleaf paspalum is not conspicuous at any season. It flowers from spring to fall and dries up in winter.

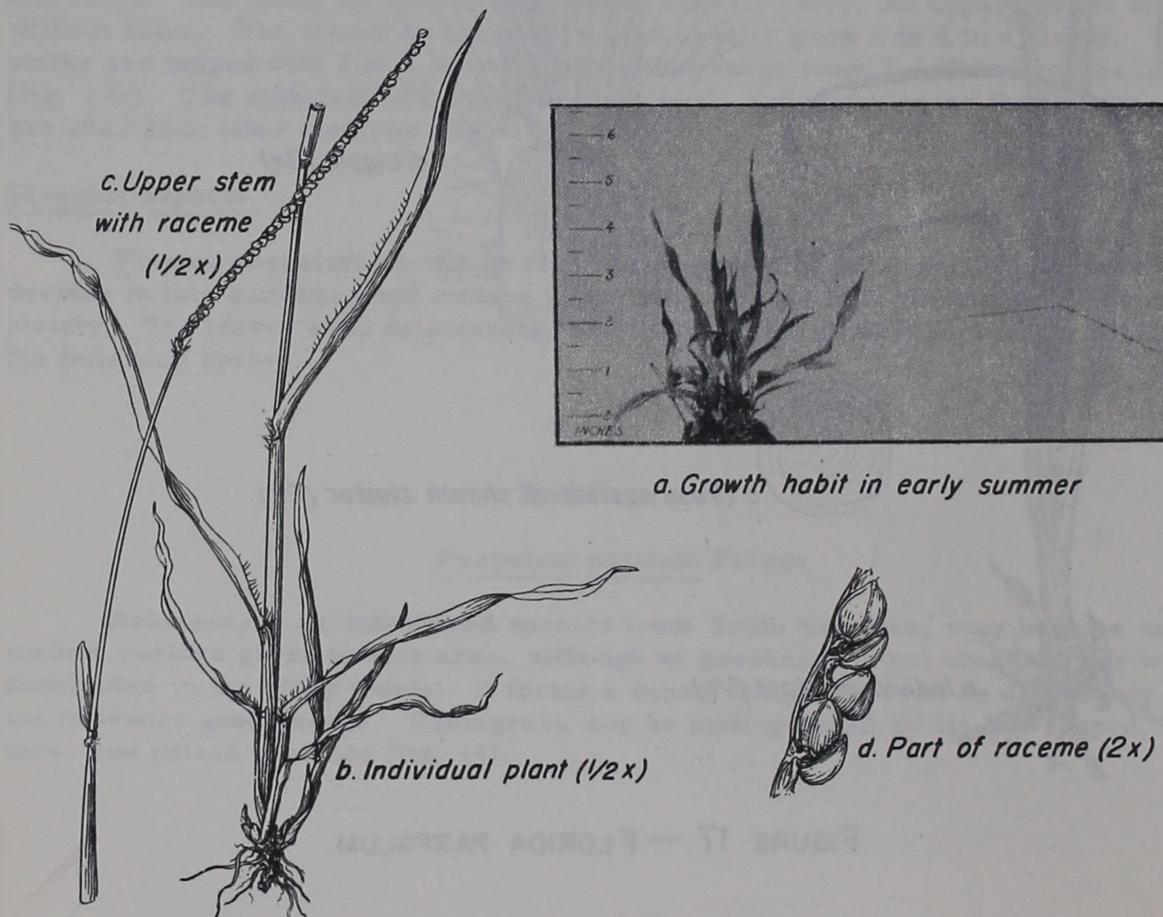


FIGURE 18.—FRINGELEAF PASPALUM

Vaseygrass

Paspalum urvillei Steud.

Vaseygrass (fig. 19) grows in moist soil along ditches and roadsides, often in association with bushy bluestem and switchgrass. It was introduced from South America and is not abundant in the piney woods. It is good cattle forage in spring and summer, but close grazing destroys it.

Description

A robust bunchgrass that grows in large leafy clumps topped by tall, conspicuous flower stalks (fig. 19a).

The leaves grow in distinct clusters. The sheaths are reddish-purple, keeled but not flattened, and have coarse hairs. The blades are flat, 3 to 15 inches long, and often more than 1/2 inch wide. They have very few hairs and are minutely saw-toothed.

The flower stalks are large and cane-like. They rise 3 to 7 feet tall, are unbranched, and stand erect or lean gracefully. Each stalk is topped by an unusually large cluster of 12 to 20 crowded racemes 2 to 6 inches long (fig. 19b). The spikelets (fig. 19c) have long silky hairs on the margins and are abruptly pointed. The plant blooms from spring to fall.

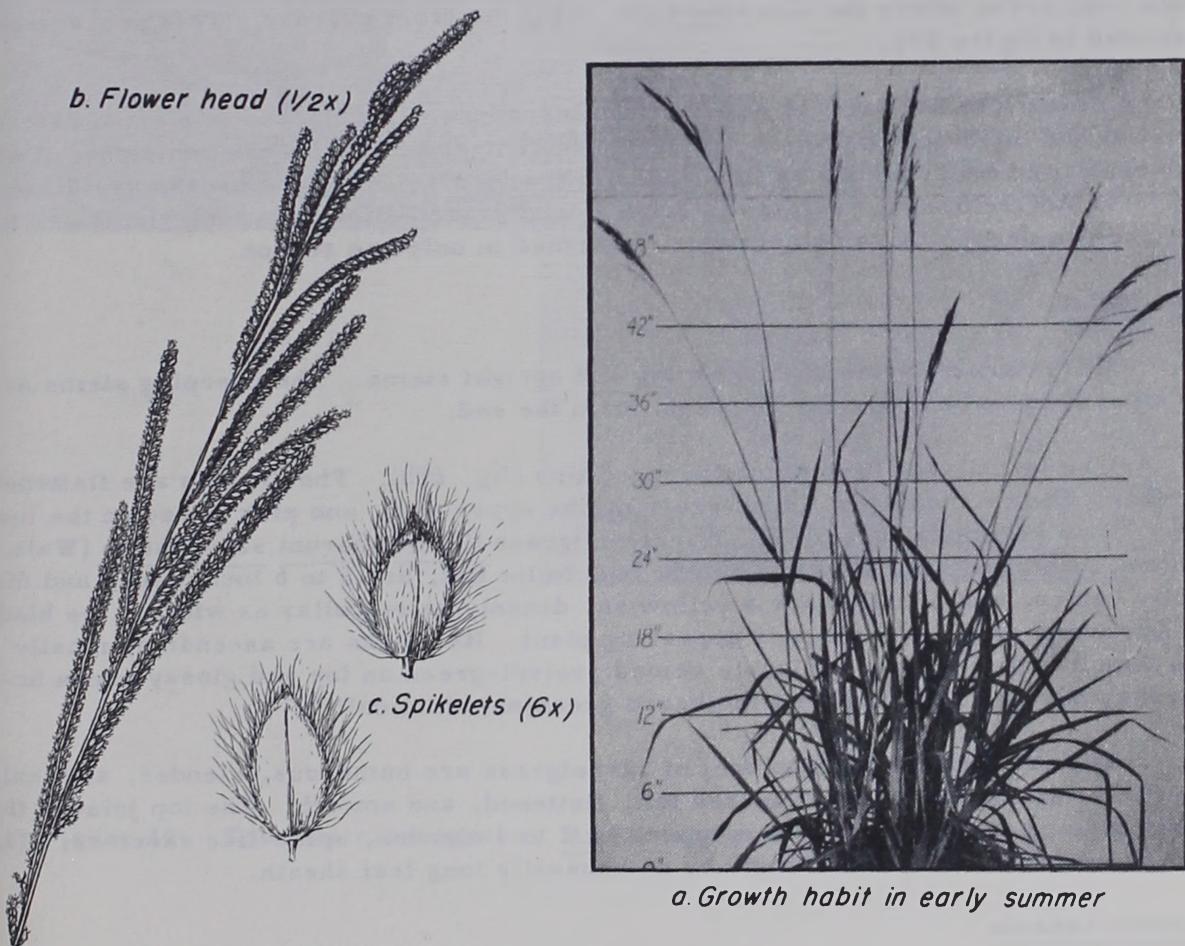


FIGURE 19.—VASEYGRASS

OTHER GRASSES

The grasses discussed so far--the bluestems, panicums, and paspalums--make up almost three-fourths of the average yearlong cattle diet in the piney woods. Most of the rest of the forage for range cattle--about 18 percent--comes from miscellaneous grasses of other genera. Some of these other grasses are described in the following pages; there is no discussion of the genera to which the individual species belong, but usually the species is representative of its genus. Lack of space prevents a description of still other important southern grasses, such as Indian grass (Sorghastrum nutans (L.) Nash), purpletop or greasegrass (Tridens flavus (L.) Hitchc.), toothache grass (Ctenium aromaticum (Walt.) Wood), and the well-known Bermuda grass (Cynodon dactylon (L.) Pers.) and Johnsongrass (Sorghum halepense (L.) Pers.).

Common carpetgrass

Axonopus affinis Chase

Common carpetgrass (fig. 20) grows on closely grazed sites, especially along old trails and in abandoned fields and moist sandy meadows. It makes up less than 1 percent of the herbaceous vegetation on pine forest ranges, but contributed about 4 percent of the cattle diet in a study in central Louisiana. Though grazed yearlong, carpetgrass is utilized most heavily from July to February. It forms a sod on many closely grazed spots, furnishes succulent forage, and protects the soil from excessive erosion. It stands heavy grazing better than any other native range grass and consequently often takes over areas where the bluestems are dying out from overuse. This process is illustrated in figure 20a.

Along with Dallisgrass and common lespedeza, carpetgrass is planted extensively in the South for improved pastures. In central and southwest Louisiana, it has also been used successfully on firebreaks in the forest. When the breaks are disked and fertilized before carpetgrass is seeded, and grazed after the young plants are established, a dense sod can sometimes be formed in only one season.

Description

Carpetgrass forms both creeping and upright stems. The creeping stems are the most abundant and are the ones that form the sod.

The leaf blades have blunt, rounded tips (fig. 20b). The sheaths are flattened together, thin on the edges, faded green on the upper part, and pink to red on the lower part. They resemble those of St. Augustine grass (Stenotaphrum secundatum (Walt.) Kuntze). However, carpetgrass blades tend to lie flat, are 2 to 6 inches long and distinctly veined, and usually have a yellowish, densely hairy collar as wide as the blade. St. Augustine grass is a coarser appearing plant. Its blades are ascending, mostly less than 3 inches long, not clearly veined, velvet-green on top and glossy green below; they have a constricted but thickened greenish-white collar.

The creeping stems (stolons) of carpetgrass are numerous, slender, and leafy. The flower stems are 10 to 14 inches tall, flattened, and smooth. The top joint of the flower stem is very slender and is topped by 2 to 4 slender, spike-like racemes. This stem is enclosed most of its length by an unusually long leaf sheath.

Seasonal aspects

Carpetgrass retains some green leaves during all but the very cold weather. It flowers in late spring, summer, and fall.

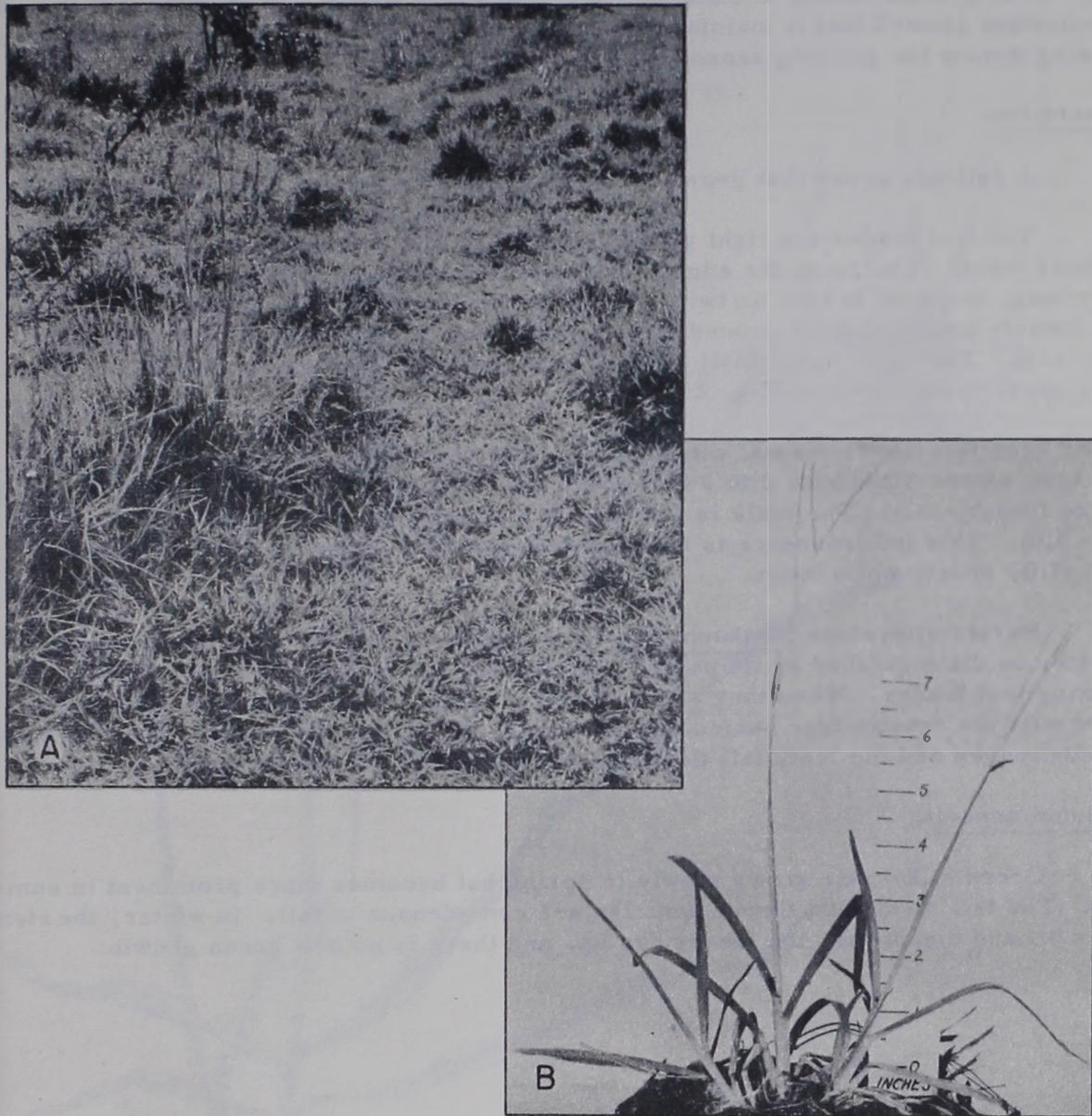


Figure 20. --Common carpetgrass. A, Closely grazed sod. B, Individual tuft.

Green silkscale

Anthaenantia villosa (Michx.) Beauv.

Green silkscale (fig. 21) grows in small, loose colonies scattered throughout the piney woods. The colonies are irregular in shape, for the plant spreads mainly by short rhizomes. On an experimental range in central Louisiana, green silkscale made up less than 1 percent of the ground vegetation and the average cattle diet year-long. It is grazed mainly in summer, fall, and early winter. A 10-year test in south Mississippi showed that it maintains its stand under both annual winter burning and grazing during the growing season.

Description

A delicate grass that grows in loose, spreading clumps (fig. 21, a and b).

The leaf blades are light green, often silky and soft in appearance, have a distinct fringe of hairs on the edges, are usually 1/4 to 1/2 inch wide and 4 to 12 inches long, and tend to curl or twist especially when young. The sheaths are rounded and loosely open; near the ground they overlap each other and hence are crowded (fig. 21b). The ligule is a small ridge-like membrane from which a semi-circle of very short hairs sticks up (fig. 21c).

The few flower stems, often only one per plant, are produced in fall. They are very slender, but rise 2 to 3 feet above the leaf clump. Leaves are inconspicuous on the flower stalk. The stalk is tipped with a slender, pale-green terminal panicle (fig. 21d). This inflorescence is made up of small oval spikelets that are covered with stiff, short, white hairs.

Purple silkscale (Anthaenantia rufa) is closely related to green silkscale but may be distinguished by its purple panicle, and by its long, slender, erect-growing leaf blades. When they are in flower, either of the silkscales may be confused with the rosette type panicums. However, the silkscale grasses lack the basal rosette leaves and the leafy fall flower stalks typical of the rosette panicums.

Seasonal aspects

Green silkscale grows slowly in spring but becomes more prominent in summer. The tall stems and flower panicles are conspicuous in fall. In winter, the stems break off and disappear, the leaves dry up, and there is no new green growth.

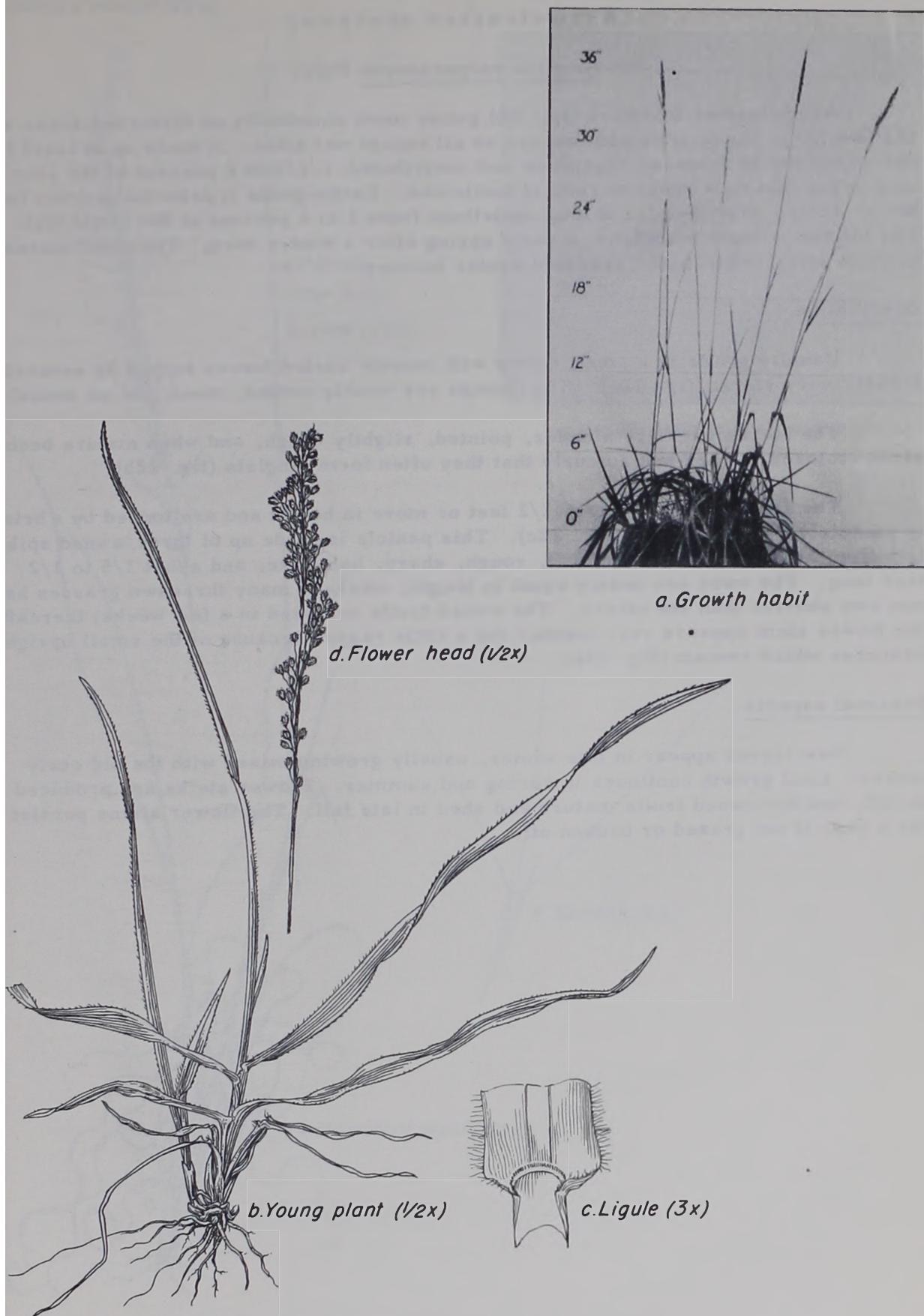


FIGURE 21.—GREEN SILKSCALE.

Arrowfeather threeawn

Aristida purpurascens Poir.

Arrowfeather threeawn (fig. 22) grows most abundantly on disturbed areas and shallow, dry, sandy soils, but occurs on all except wet sites. It made up at least 1 percent of the herbaceous vegetation and contributed 1-1/2 to 2 percent of the year-long cattle diet on a range in central Louisiana. Cattle graze it principally from October to April. In midwinter it may contribute from 2 to 6 percent of the cattle diet. The foliage is most nutritious in early spring after a winter burn. The plant increased in south Mississippi under repeated winter burning.

Description

Usually grows in a small clump with loosely curled leaves topped by several slender wiry stems (fig. 22a). The clumps are weakly rooted, much like an annual.

The leaves are very slender, pointed, slightly rough, and when mature become straw-colored. They are so curly that they often form ringlets (fig. 22b).

The stems are 1-1/2 to 2-1/2 feet or more in height and are topped by a bristly panicle 1/2 to 1 foot long (fig. 22c). This panicle is made up of three-awned spikelets (fig. 22d). The awns are stiff, rough, sharp, hair-like, and about 3/5 to 1/2 inch long. The awns are nearly equal in length, whereas many threeawn grasses have one awn shorter than the others. The awned fruits are shed in a few weeks; thereafter the flower stem appears very slender but a little ragged because of the small upright branches which remain (fig. 22e).

Seasonal aspects

New leaves appear in late winter, usually growing mixed with the old curly leaves. Leaf growth continues in spring and summer. Flower stalks are produced in fall, and the awned fruits mature and shed in late fall. The flower stems persist for a year if not grazed or broken off.

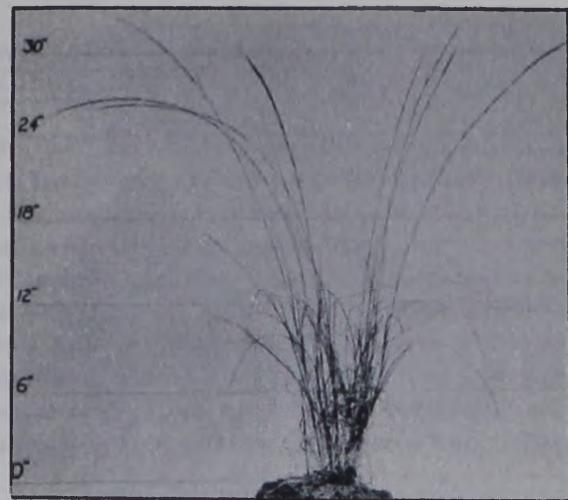
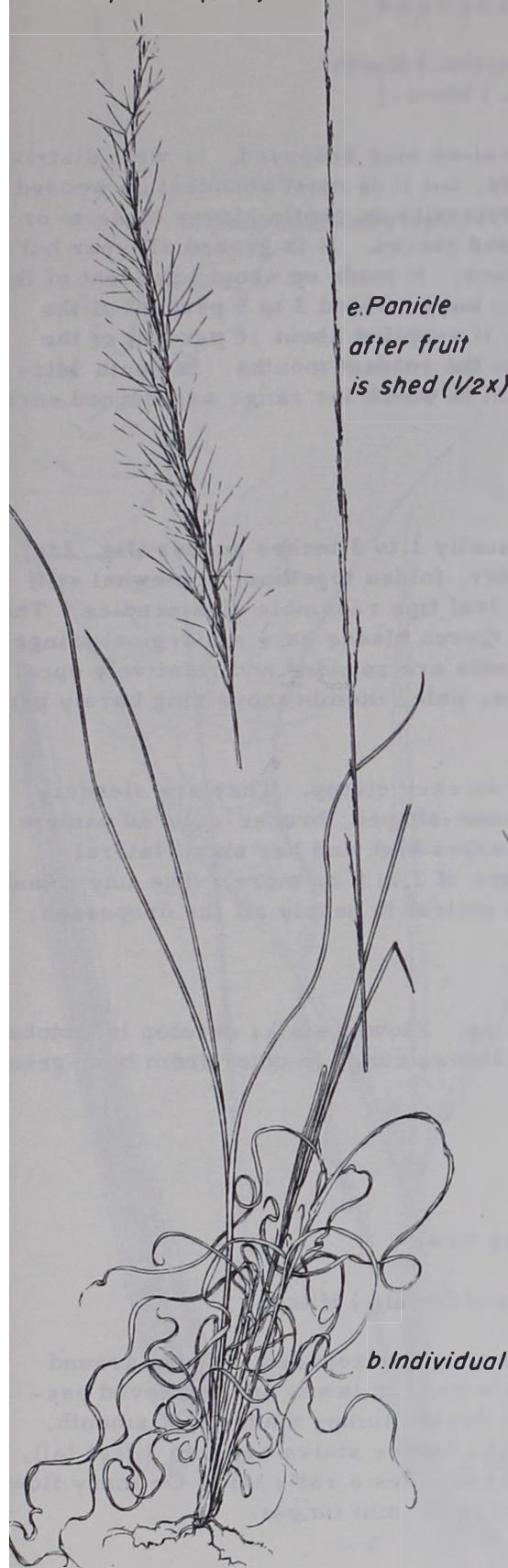
Mature panicle ($1/2x$)d. Spikelet ($2x$)b. Individual plant ($1/2x$)

FIGURE 22.—ARROWFEATHER THREEAWN

Pineywoods dropseed

Sporobolus junceus (Michx.) Kunth
 (= S. gracilis (Trin.) Merr.)

Pineywoods dropseed (fig. 23), locally called blue dropseed, is well distributed throughout the cut-over longleaf pine lands, but it is most abundant on wooded and reasonably well-drained places. It grows typically on gentle slopes close to or under trees, indicating that it prefers half-shaded places. It is grazed all year but most heavily in winter, spring, and early summer. It made up about 1 percent of the ground cover on one range in central Louisiana, but provided 3 to 5 percent of the yearlong cattle diet. In January and February, it supplied about 10 percent of the grazing--some green leaves are present even in the coldest months. In south Mississippi it maintained its stand in a ten-year test in which the range was burned each winter and grazed in spring and summer.

Description

Grows in small, dense, rounded tufts usually 1 to 3 inches across (fig. 23a). The leaf blades are distinctly blue-green, slender, folded together, somewhat stiff or tough, and pointed at the tip (fig. 23c). Dry leaf tips resemble pine needles. The blades are 1 to 12 (usually 4 to 8) inches long. Green blades have a marginal fringe of long hairs near the base (fig. 23b). The sheaths are rounded and relatively open, and have no hairs (fig. 23d). The ligule is a low, pale, membranous ring barely perceptible to the naked eye.

One to three flower stems are produced on each clump. They are slender, erect, 1 to 3 feet tall, and bear an attractive, cone-shaped, bronze-colored panicle (fig. 23, a and e). The panicle is about 6 to 9 inches high and has small lateral branches evenly spaced around the stem in groups of 3 to 5 or more. The tiny round fruits or grains shed soon after maturity, as is typical in nearly all the dropseeds.

Seasonal aspects

Most leaf growth is produced in late spring. Flower stalks develop in October and persist for several months. In winter, the leaves range in color from blue-green to tan, brown, and straw.

Rattail smutgrass

Sporobolus poiretii (Roem. and Schult.) Hitchc.

Rattail smutgrass, closely related to pineywoods dropseed, occurs around farm buildings, in yards, and in corrals; and is a weed in lawns and improved pastures. It is seldom grazed. The plant grows in dense clumps made up of smooth, thin, shiny green leaves 10 to 20 inches long. The flower stalks are 2 to 3 feet tall, slender, and tough. The spikelike flower head resembles a rat's tail. On many flower heads the normally green panicle is blackened by a smut fungus.

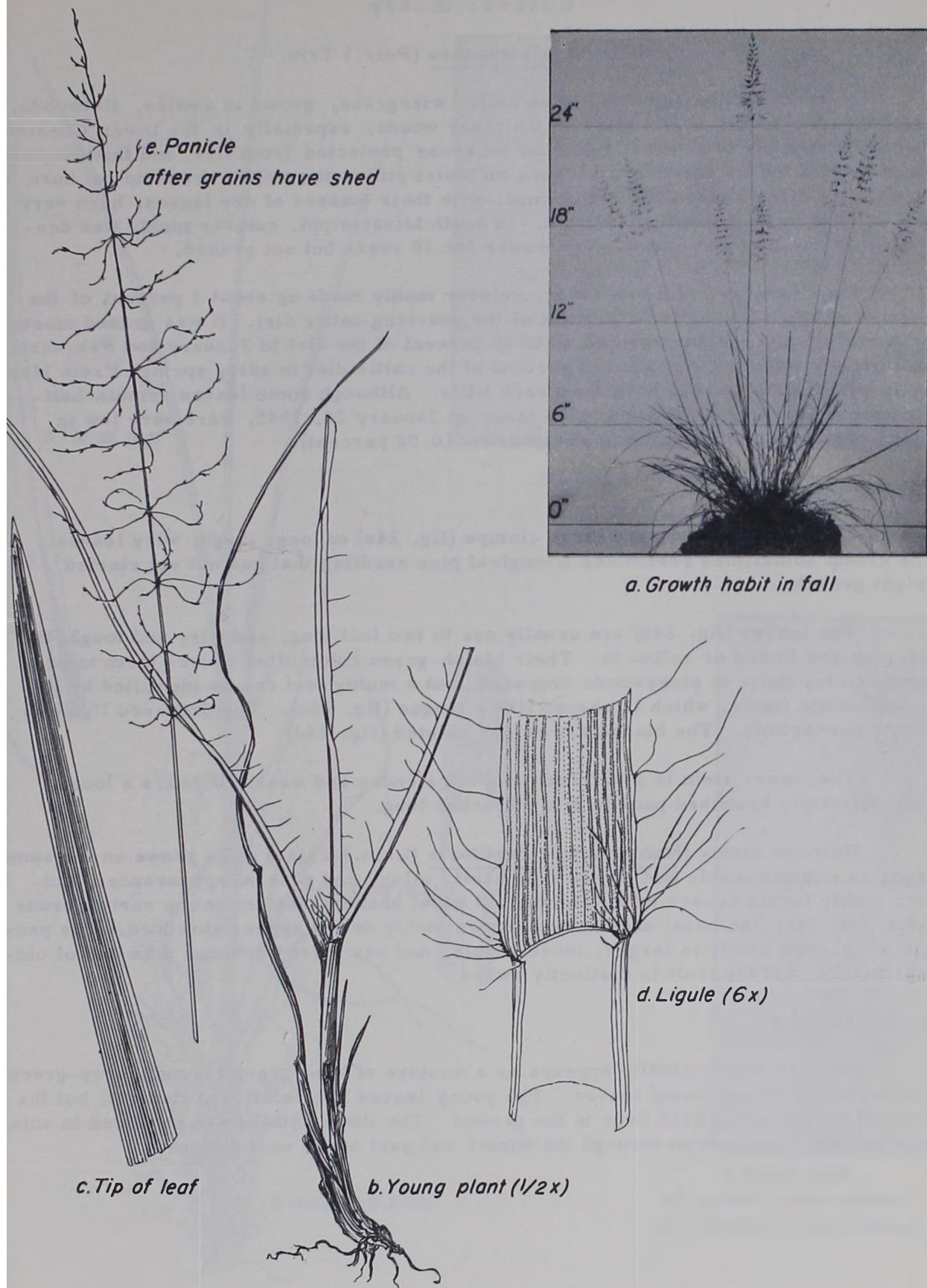


FIGURE 23.—PINEYWOODS DROPSSEED.

Cutover muhly

Muhlenbergia expansa (Poir.) Trin.

Cutover muhly (fig. 24), often called wiregrass, grows in swales, flatwoods, and generally moist or wet sites in the piney woods, especially in the lower Coastal Plain. It appears to be most abundant on areas protected from fire, and this may account in part for its relative abundance on moist sites--the wetter areas do not burn as often as drier sites. The big clumps, with their masses of dry leaves, burn very hot, so that many are killed outright. In south Mississippi, cutover muhly was destroyed by fire on plots burned each winter for 10 years but not grazed.

On a central Louisiana range, cutover muhly made up about 1 percent of the vegetation and a little over 2 percent of the yearlong cattle diet. It was grazed mostly in midwinter, and contributed up to 10 percent of the diet in January and February. New growth provided about 2-1/2 percent of the cattle diet in early spring. From May to November this grass was grazed very little. Although some leaves remain half-green in midwinter, foliage samples taken on January 24, 1945, were very low in crude protein (2.8 percent) and phosphorous (0.02 percent).

Description

Grows in large to very large clumps (fig. 24a) of long, tough, wiry leaves. The clump sometimes resembles a longleaf pine seedling that has not yet started height growth.

The leaves (fig. 24b) are usually one to two feet long, and wiry and tough; the margins are folded or rolled in. Their bluish-green color often causes them to be mistaken for those of pineywoods dropseed, but a muhly leaf can be identified by its pointed white ligule, which is shaped like a tongue (fig. 24c). The dropseed ligule is barely perceptible. The blades are rather pointed (fig. 24d).

The flower stem is 1 to 3 feet long but slender and weak. It bears a loose, very delicately branched panicle 4 to 18 inches long.

Hairawn muhly (Muhlenbergia capillaris (Lam.) Trin.) often grows on the same areas as cutover muhly and is like it in habit, value, and general appearance. Cutover muhly forms denser tufts, and the old basal sheaths weather into a curly fibrous mass (fig. 24e); the basal sheaths in hairawn muhly do not appear shredded. The panicle of hairawn muhly is larger, more purple, and has more branches than that of cutover muhly, and the fruit is distinctly awned.

Seasonal aspects

Cutover muhly usually appears as a mixture of blue-green (young), grey-green (mature), and brown (dead) leaves. The young leaves are relatively straight, but the older ones eventually bend over to the ground. The flower stalks are produced in summer and fall, and persist through the winter and part of the next summer.

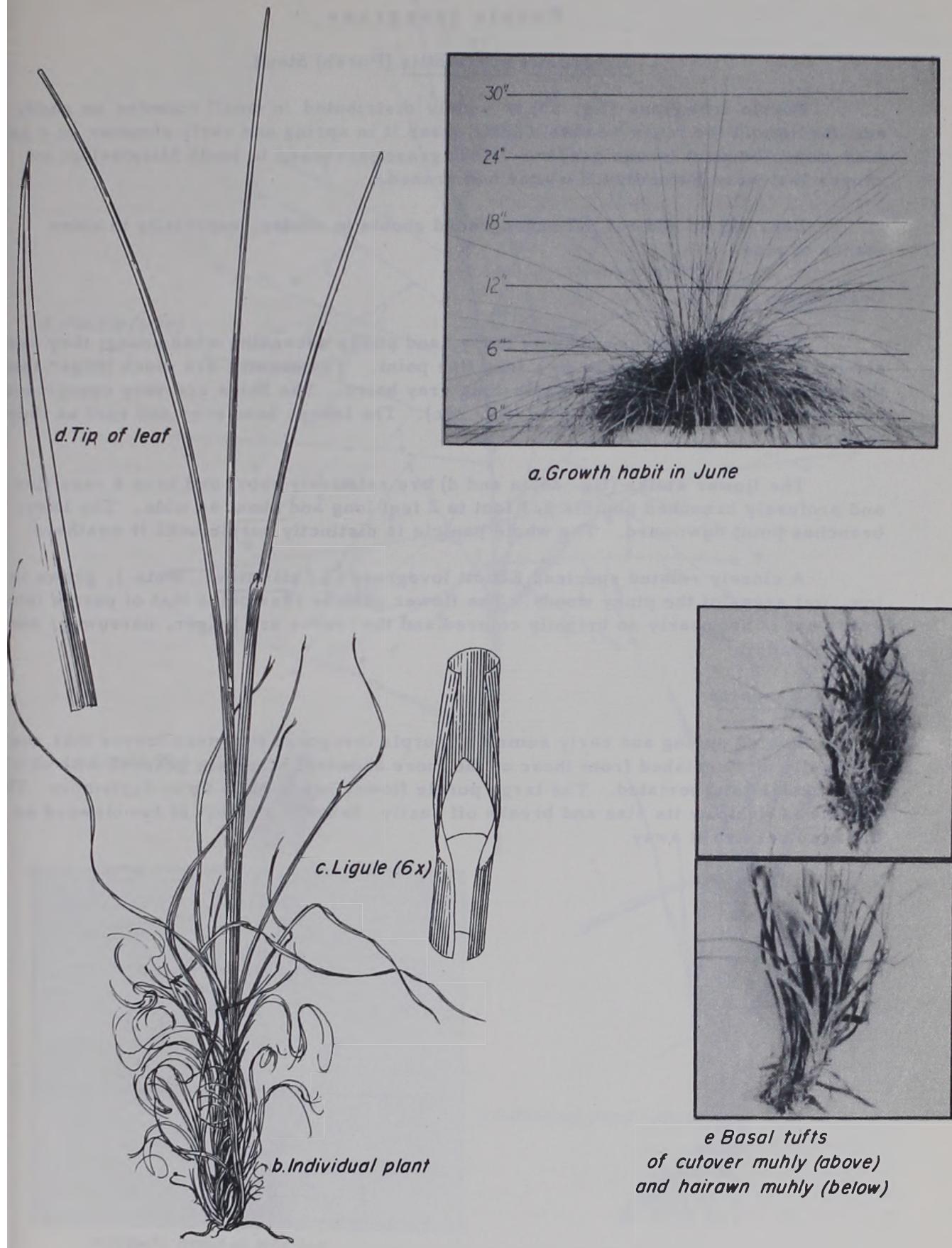


FIGURE 24.—CUTOVER MUHLY.

Purple lovegrass

Eragrostis spectabilis (Pursh) Steud.

Purple lovegrass (fig. 25) is widely distributed in small colonies on sandy soil throughout the piney woods. Cattle graze it in spring and early summer on a pasturage with more abundant forage grasses. This grass increased in south Mississippi on ranges that were burned each winter and grazed.

Deer dig up and eat the underground shoots in winter, especially in older stands of pine.

Description

The leaf blades are densely hairy, and stiffly ascending when young; they are about 1/3 inch wide but taper to a long fine point. The sheaths are much longer than the internodes and are covered with long gray hairs. The hairs are very conspicuous near the small membranous ligule (fig. 25c). The leaves bend over and curl as they mature.

The flower stalks (fig. 25, a and d) are relatively short and have a very fine and profusely branched panicle 2/3 foot to 2 feet long and about as wide. The lower branches point downward. The whole panicle is distinctly purple until it weathers.

A closely related species, Elliott lovegrass (E. ellottii S. Wats.), grows in low, wet areas of the piney woods. The flower panicle resembles that of purple lovegrass but is not nearly so brightly colored; and the leaves are longer, narrower, and more slender.

Seasonal aspects

During spring and early summer, purple lovegrass produces leaves that are not easily distinguished from those of the more abundant bluestem grasses with which this species is associated. The large purple flower heads show up in September. The panicle is light for its size and breaks off easily, becoming a sort of tumbleweed as the wind carries it away.

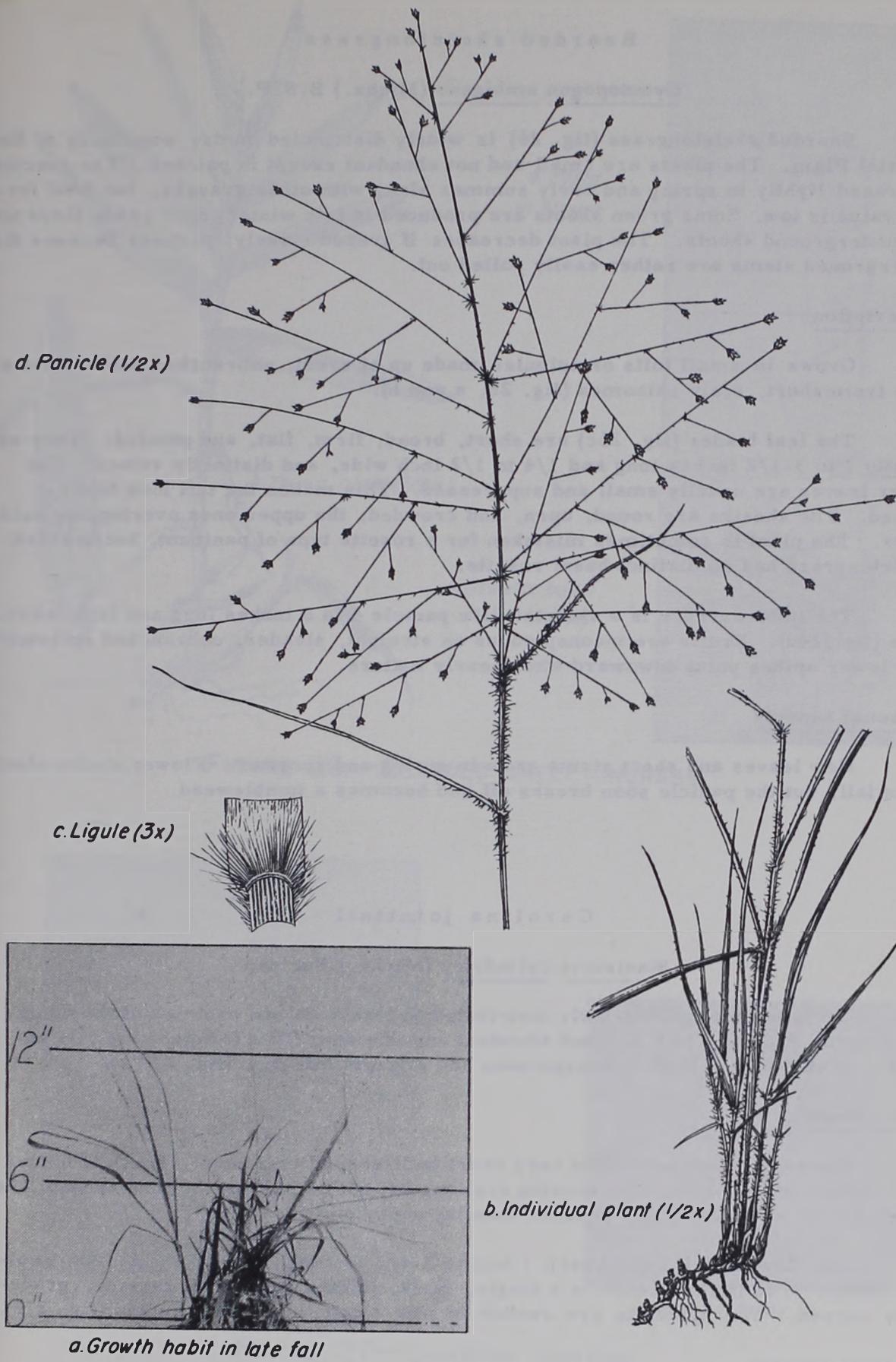


FIGURE 25.—PURPLE LOVEGRASS.

Bearded skeltongrass

Gymnopogon ambiguus (Michx.) B.S.P.

Bearded skeltongrass (fig. 26) is widely distributed in dry woodlands of the Coastal Plain. The plants are small and not abundant except in patches. The species is grazed lightly in spring and early summer along with other grasses, but total forage value is low. Some green shoots are produced in late winter; deer graze these and the underground shoots. The plant decreases if grazed closely, perhaps because the underground stems are rather easily pulled out.

Description

Grows in small tufts or colonies made up of erect, unbranched stems that arise from short, scaly rhizomes (fig. 26, a and b).

The leaf blades (fig. 26c) are short, broad, firm, flat, and pointed. They are mostly 1 to 3-1/2 inches long and 1/4 to 1/2 inch wide, and distinctly veined. The lower leaves are usually small and suppressed. This makes the tuft look bushy-topped. The sheaths are round, open, and crowded, the upper ones overlapping each other. The plant is sometimes mistaken for a rosette type of panicum, but bearded skeltongrass has no distinct basal rosette.

The inflorescence is a skeleton-like panicle 4 to 8 inches long and fully as wide (fig. 24d). Fruits are inconspicuous on straight, slender, unbranched spikes. The lower spikes point downward when nearly mature.

Seasonal aspects

New leaves and short stems grow in spring and summer. Flower stalks shoot up in fall, but the panicle soon breaks off and becomes a tumbleweed.

Carolina jointtail

Manisuris cylindrica (Michx.) Kuntze

Carolina jointtail is widely distributed in pinelands and prairies of the southern Coastal Plain. While it is not abundant and has very little forage value, its unusual, jointed flower head is conspicuous and attracts attention (fig. 27, a).

Description

Grows in loose tufts from very short bulb-shaped rhizomes. The leaf blades are slender and pointed. The sheaths are long but not so long as the internodes. The basal blades and sheaths are smaller than the upper ones.

The flower stalks are erect, 1 foot to 3-1/2 feet tall, and have purplish, swollen nodes. The inflorescence is a single, thick, jointed spike-like raceme, gracefully curved. The spikelets are sunken in pits along the jointed rachis (fig. 27b).

Seasonal aspects

Carolina jointtail produces flower stalks in May and June and dries up in early summer. It is dormant in winter.

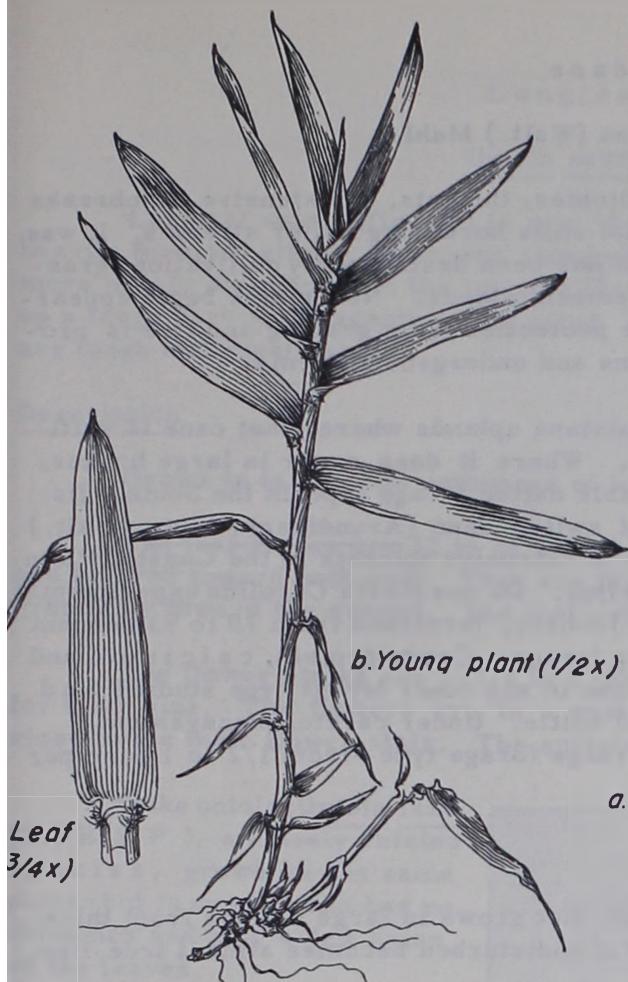


FIGURE 26.—BEARDED SKELETONGRASS

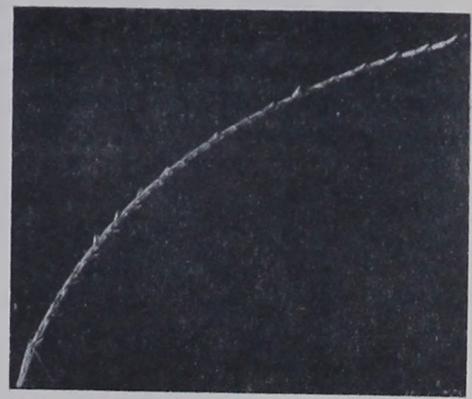
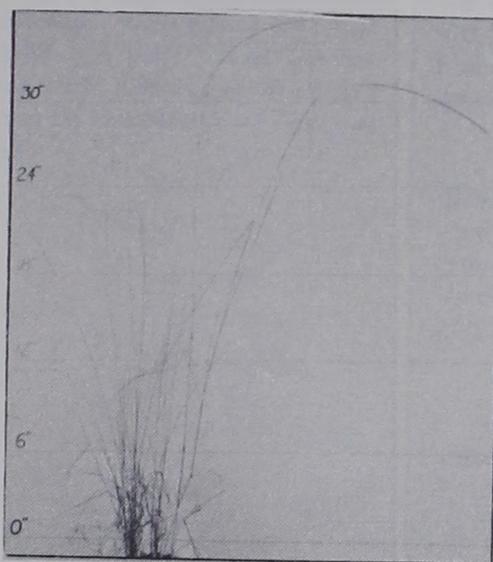
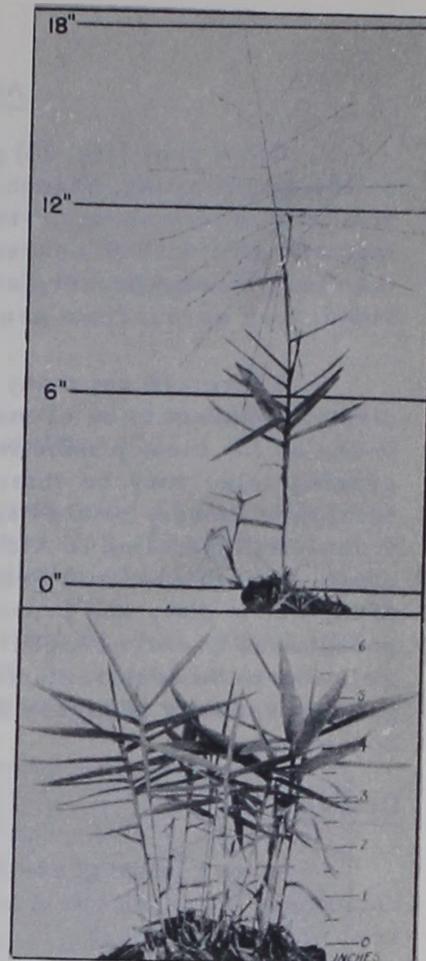


FIGURE 27.—CAROLINA JOINTTAIL.

Giant cane

Arundinaria gigantea (Walt.) Muhl.

Giant cane (fig. 28) grows in small colonies, thickets, or extensive canebreaks on low moist areas, branch heads, and alluvial soils bordering major streams. It was once much more abundant than at present, but has been destroyed by cultivation, grazing, and fire until it now exists mainly in remnant stands. New plants begin appearing along stream borders a year or two after protection from grazing and fire is provided; they sprout from heavily grazed crowns and underground stems.

There are not many places in the Louisiana uplands where giant cane is sufficiently abundant to be of much grazing value. Where it does occur in large brakes, it can be the most productive and most valuable native forage type in the South. Its grazing value may be inferred from that of switch cane (Arundinaria tecta (Walt.) Muhl.), a closely related species that grows in extensive thickets in the Coastal Plain from North Carolina to Alabama and Mississippi. On one North Carolina experimental range, switch cane was grazed from May to January, furnished from 70 to 93 percent of the cattle diet, and provided a high-quality forage. Crude protein, calcium, and phosphorus averaged higher in switch cane than in any other forage type studied and well above the requirements for growing beef cattle. Under careful management, grazing capacity is higher than in any other range forage type--from 1/2 to 1 acre per cow month.

Description

A very large grass of the bamboo tribe that grows in large clumps from thick rhizomes. It usually is 4 to 10 feet tall, but if undisturbed becomes almost tree-like, reaching up to 30 feet.

Leaves occur in fan-shaped groups of 3 to 5 at the end of small branches. The lower leaves have long sheaths that overlap the sheaths above. Unlike other grasses here discussed, each leaf of the bamboos has a short petiole between the sheath and the blade. The blades are usually 4 to 11 inches long and 1/2 inch to 1-1/2 inches wide. They taper to a sharp point.

The stems are canes of various sizes, with distinct joints 3 to 5 inches or more apart. They remain alive for many years, getting larger each year. New branches and leaves are formed annually. Flowers appear at infrequent intervals.

Seasonal aspects

Green leaves and twigs are present on branches of the main stem throughout the year.

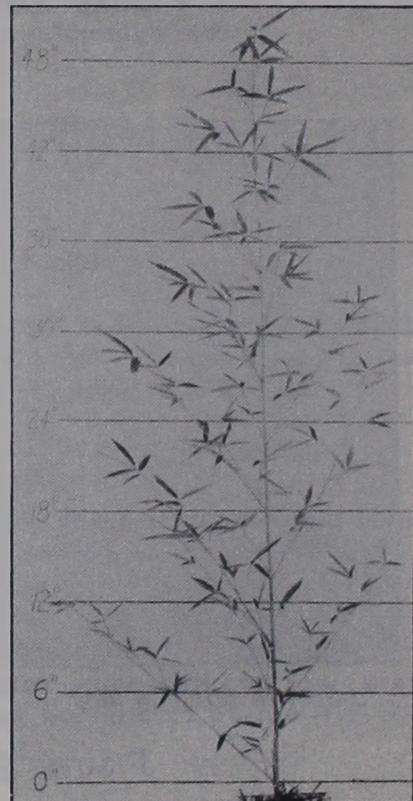


Figure 28. --Giant Cane.

Longleaf uniola

Uniola sessiliflora Poir.

Longleaf uniola (fig. 29) is one of the most characteristic grasses on moist, heavily forested sites. It occurs along stream courses in the longleaf belt, but is more widely distributed in the loblolly pine and hardwood types, where it often makes up a large part of the scanty grass stand. Its grazing value is low because the leaves are tough and unpalatable.

Description

Grows in large tufts composed of leaves and flower stalks.

The leaf blades are 12 to 24 inches long, about $2/5$ inch wide at the center, and tapered toward both ends. They are blue-green, broad, and flat. The ends droop gracefully toward the ground. The leaf collar has a dense cluster of hairs.

The flower stalks are 1-1/2 to 5 feet tall, slender, straight, and rather stiff for their size. The flowers are in a spike-like panicle with its branches growing close to the main flower stalk. The spikelets are small, pointed, and wedge-shaped.

Spike uniola (Uniola laxa (L.) B. S. P.), a closely related species, grows in the same places but is smaller and has no rhizomes and only a few hairs on the leaves.

Seasonal aspects

Flower stalks of longleaf uniola are produced from June to October, and some persist for about one year. The leaves become stiff and tough when dry and stay on the plant for several months.

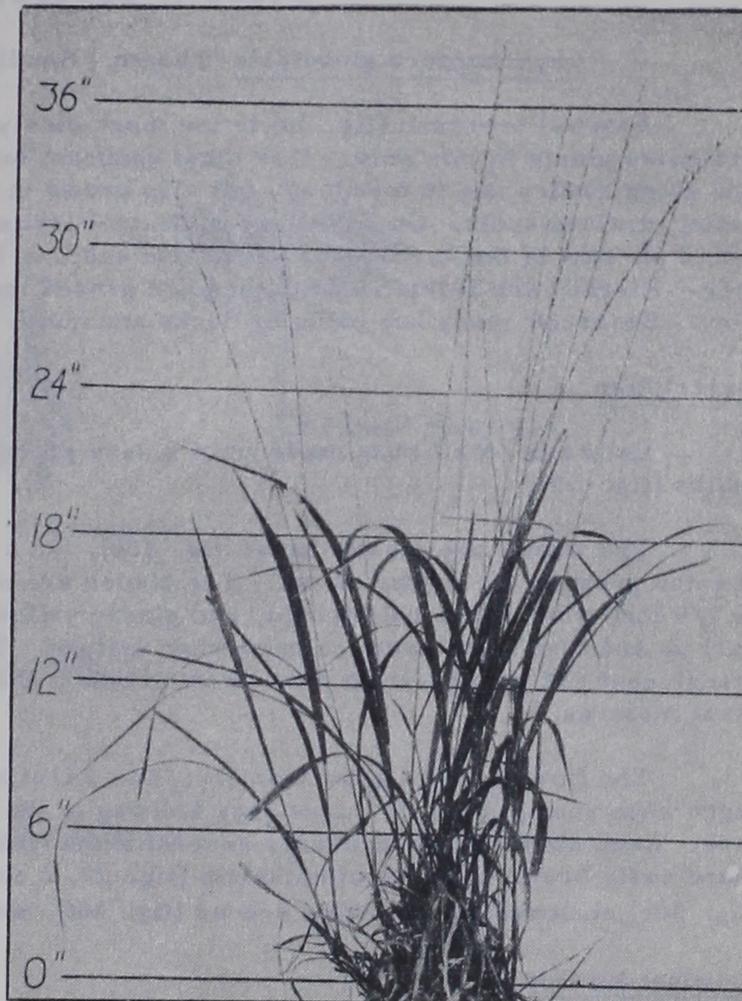


Figure 29. --Longleaf uniola: growth habit in early summer.

GRASSLIKE PLANTS

The herbaceous plants that fall into the sedge (Cyperaceae) and rush (Juncaceae) families are commonly called grasslike plants. All have clumps of long narrow leaves, slender stems that usually are unbranched, and small colorless flowers. The forage value of the southern species of these plants needs further study. On one experimental range in central Louisiana grasslike plants made up 2 to 4 percent of the ground cover and from 2 to 6 percent of the cattle diet for yearlong grazing.

SEDGES (CYPERACEAE)

The sedges have solid, unjointed, and usually three-sided stems. Leaves are produced on each of the three sides and are thus in three ranks. Grass leaves grow in two ranks. The sheaths of sedges are closed and completely surround the triangular stem. Sedge flowers usually occur in clusters or small heads on or near the tip of the flower stalk. They have no petals or colorful parts.

Pinehill beakrush

Rhynchospora globularis (Chapm.) Small var. recognita Gale

Pinehill beakrush (fig. 30) is the most widely distributed and important of the grasslike plants in this area. It is most abundant on poorly-drained flatwoods soils and along swales and in meadows, but also grows in mixture with bluestems on sandy, better-drained spots. On one range in central Louisiana, pinehill beakrush made up 1 to 2 percent of the herbaceous vegetation and 2 to 3 percent of the cattle diet year-long. Pinehill and related beakrushes are grazed most heavily from December to May. Beakrush seeds are eaten by ducks and quail.

Description

Grows in small tufts made up of glossy green leaves and a few slender flower stalks (fig. 30).

The leaves are mostly basal (fig. 30b), but a few short-bladed ones with long sheaths grow on the flower stems. The blades are slender, 4 to 12 inches long, 1/8 to 1/5 inch wide, often half-folded, and glossy yellow green. They have no hairs, and curl up and turn light straw-colored when mature. The sheaths are membranous or translucent and pale green to pale straw in color; the lower ones split open as the plant matures.

The flower stalks grow from 1-1/2 to 3 feet tall. They are slender and upright when young, but may curve over halfway to the ground as the flower heads mature. Each stem usually produces several short branches, each topped by one or more rusty brown clusters of spikelets (fig. 30, c and d). Each fertile spikelet (fig. 30e) encloses one wrinkled achene (fig. 30f) that has a pointed cap.

Seasonal aspects

Green leaves are present most of the year. Flower stalks are produced in late spring and summer. The stems persist a year or more.

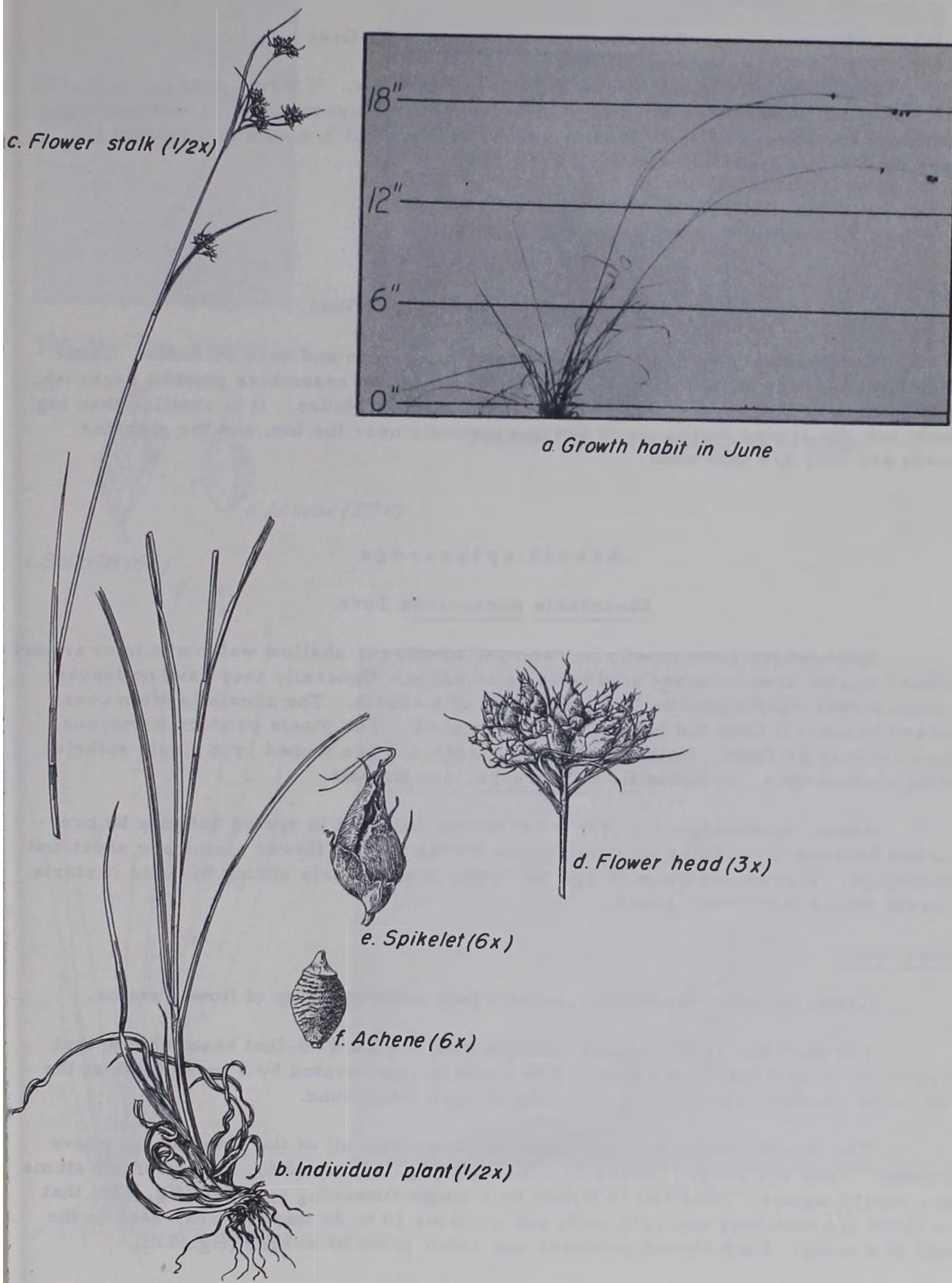


FIGURE 30.—PINEHILL BEAKRUSH.

Big beakrush

Rhynchospora cephalantha A. Gray

Big beakrush (fig. 31) grows in bogs and swamps. It forms a large, leafy tuft that has good forage value in spring. The flower stalks grow erect, 3 to 4 feet high. Spikelets are borne in 3 to 5 globular, dense heads about 3/4 inch in diameter and have dark brown taper-pointed scales.

Nodding beakrush

Rhynchospora glomerata (L.) Vahl.

Nodding beakrush (fig. 32) also grows in swamps and near streams. Cattle find it good forage in April and May. The plant closely resembles pinehill beakrush, but it forms larger bunches and the leaves have wider blades. It is smaller than big beakrush; the flower stalks curve over, especially near the top; and the globular heads are only 3/8 inch wide.

Annual spikesedge

Eleocharis microcarpa Torr.

Spikesedges grow mostly in swamps, meadows, shallow water and in or around ponds--nearly always in wet acid soils or in water. Generally they have no leaves, except a very short spine or bract at the tip of a sheath. The sheath is often overlooked because it hugs the base of the flower stalk. The plants produce numerous green scapes or flower stalks that do not branch and are topped by a single spikelet. Many spikesedges, including E. microcarpa, are annuals.

Annual spikesedge (fig. 33) is relatively abundant in spring but may be overlooked because it produces no conspicuous leaves and the flower stems are short and threadlike. It provides some forage for cattle in very early spring because it starts growth before most other plants.

Description

Grows in fairly dense tufts (about 1 inch wide) made up of flower stems.

The part that is technically called a leaf is a hard-to-find basal sheath that tightly surrounds the flower stem. The blade is represented by a mere tooth at the top of the sheath. The sheaths are reddish near the ground.

The flower stems (scapes) make up essentially all of the plant that is above ground. They are about 7 inches to 1 foot tall (fig. 33, a and b). These small stems are nearly square. Each one is tipped by a single flowering spikelet (fig. 33c) that is about 1/4 inch long and 1/16 wide and contains 10 to 20 tiny flowers, each in the axil of a scale. Each flower produces one small grain or achene (fig. 33d).

Seasonal aspects

Annual spikesedge seeds germinate in late winter. The plant grows in spring, matures in early summer, dries up during midsummer, and disappears by fall or early winter.

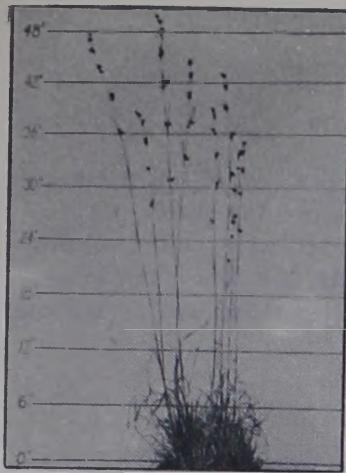


FIG. 31.—BIG BEAKRUSH

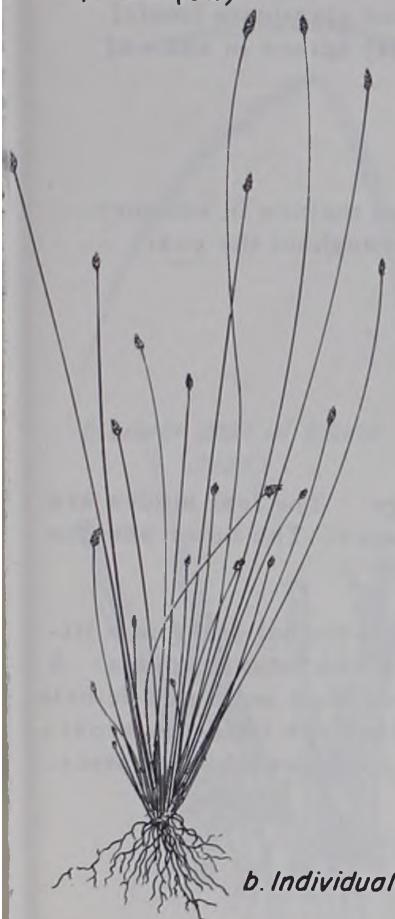


FIGURE 32.—NODDING BEAKRUSH.

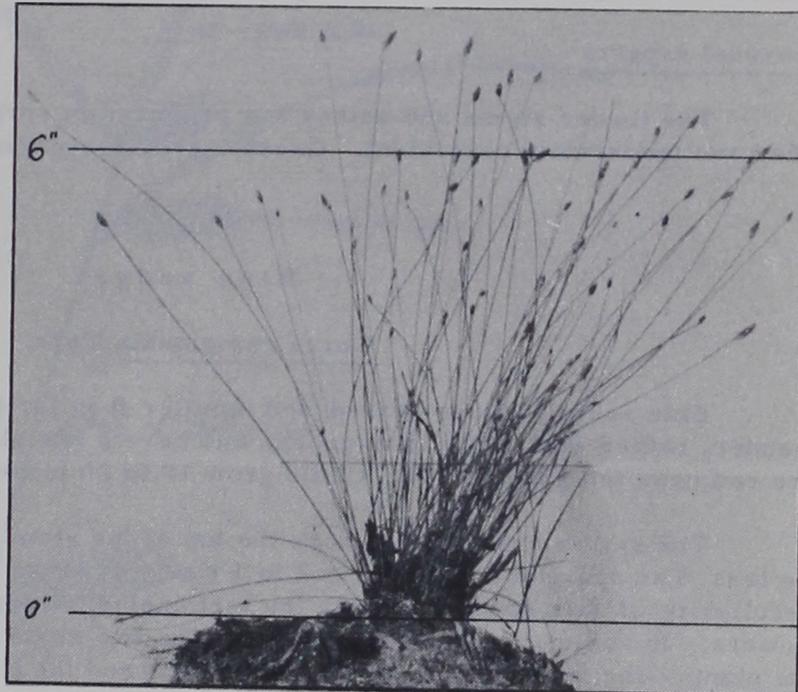


d. Achene (20x)

c. Spikelet (6x)



b. Individual plant (1/2x)



a. Growth habit in May

FIGURE 33.—ANNUAL SPIKESEDGE

Lurid sedge

Carex lurida Wahl.

Lurid sedge is a fairly typical example of the genus Carex, of which there are about 60 species in Louisiana. Sedge is the correct common name for these plants, and should not be applied to the bluestem grasses. Most sedges, lurid sedge among them, grow in acid soils, bogs, swamps, meadows, deep woods, or along the edges of lakes and streams. Some prefer dry sandy sites and even limestone soils, but on the whole they are not abundant on piney woods range.

Description

Grows in irregular shaped, leafy, open clumps (fig. 34a) from scaly rootstocks (fig. 34b). The roots are orange colored. The plant is conspicuous for its bur-like spikes and long blades.

The leaf blades are light green, 1 to 24 inches long, 1/8 to 5/8 inch wide, and flat. They have a prominent midrib and are rough-edged but not hairy (fig. 34c). The young sheaths are closed around the stem. The upper sheaths remain closed, but the lower ones split open with a ragged edge. The lower parts of the sheaths are reddish-purple.

The stem grows 1 to 3-1/2 feet tall, and is straight or leaning, unbranched, hairless, and purplish-red near the base. There is one slender staminate (male) spike at the top of each stem and two or more pistillate (female) spikes in axils of stem leaves (fig. 34c). The fruiting spikes resemble burs.

Seasonal aspects

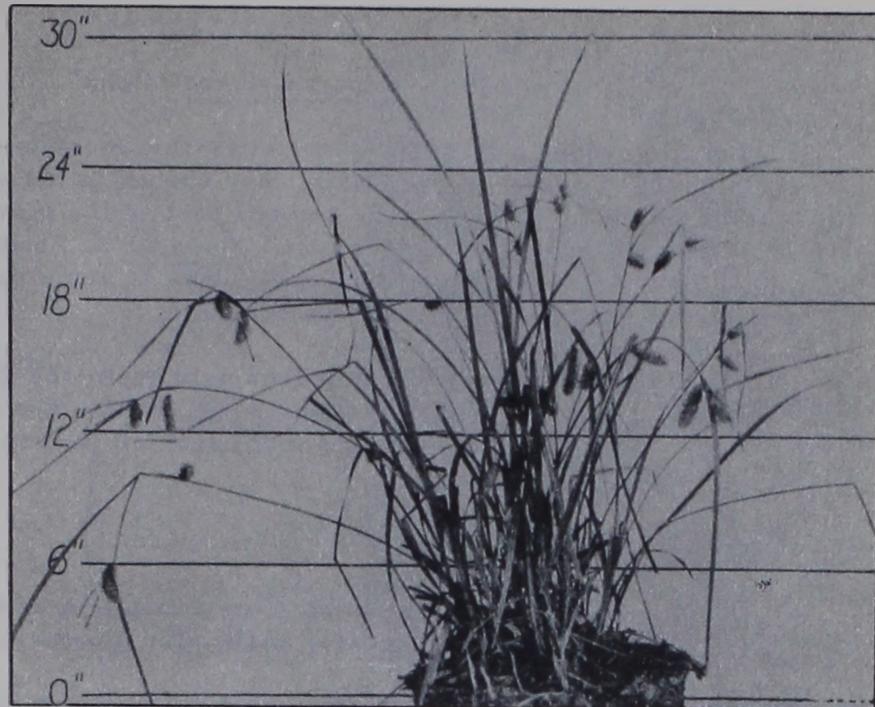
The flower stems and spikes are produced in spring and mature in summer. They are moderately persistent. Green leaves are present throughout the year.

Blue sedge

Carex complanata Torr.

Blue sedge is finer-leaved and smaller than lurid sedge. The leaf blades are slender, rather stiff, light blue-green, and have a few short hairs. The outer sheaths are red near the ground. The stems grow 10 to 20 inches tall.

The spikes are crowded near the top of the stem. The terminal spike is a little less than 1/2 inch long, but is 2 to 3 times as large as the two lateral spikes. A peculiarity of this species is that the terminal spike produces both male and female flowers. In some other species of Carex, the two kinds of spikes are borne on separate plants--the male plant produces pollen only and the female produces fruiting spikes.



a. Growth habit in June

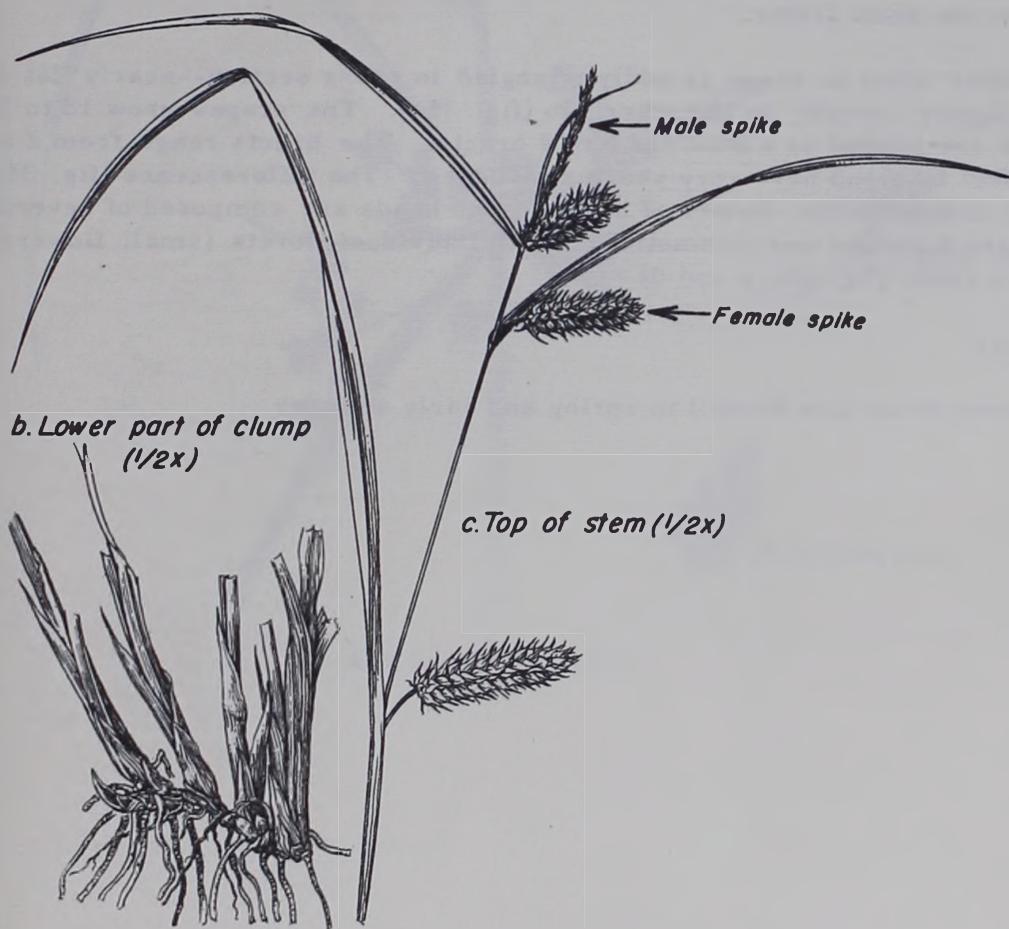


FIGURE 34.—LURID SEDGE

Green flatsedge

Cyperus virens Michx.

The flatsedges prefer the same sites that most of the true sedges do. Being chiefly tropical or sub-tropical plants, they abound in the marshes of south Louisiana and south Florida but make up only a small part of the forage on piney woods ranges. Two species, cocograss or nutgrass (C. rotundus L.) and chufa flatsedge (C. esculentus L.), are well-known weeds, though chufa is sometimes cultivated for hogs because its tuber-like rootstocks are nutritious.

The flatsedges produce true leaves only from the ground. Flower parts are borne on scapes or unbranched peduncles (fig. 35a). The scape, which looks like a stem, is topped by a whorl of bracts that resemble leaves--the bracts do not have sheaths or ligules (fig. 35b).

Description

Green flatsedge grows in small clumps made up of either a single leaf cluster about one inch wide or several loosely associated clusters.

The true leaves all arise from short rhizomes in clusters of 6 to 12, in three ranks. The blades are 6 to 18 inches long, about 1/3 to 1/2 inch wide, tapered, flat, and glabrous. The midrib is sharp-angled. The sheath is closed by a thin membrane that ruptures as the plant grows.

The flower stem or scape is oddly triangled in cross section--nearly flat on one side and slightly concave on the other two (fig. 35e). The scapes grow 18 to 36 inches tall and are topped by a whorl of 5 to 9 bracts. The bracts range from 2 inches to 3-1/2 feet long and have very sharp saw-edges. The inflorescence (fig. 35b) is an irregular umbrella-like cluster of heads. The heads are composed of several spikelets that are flattened and symmetrical, with individual florets (small flowers) arranged in two ranks (fig. 35, c and d).

Seasonal aspects

The flower heads are formed in spring and early summer.

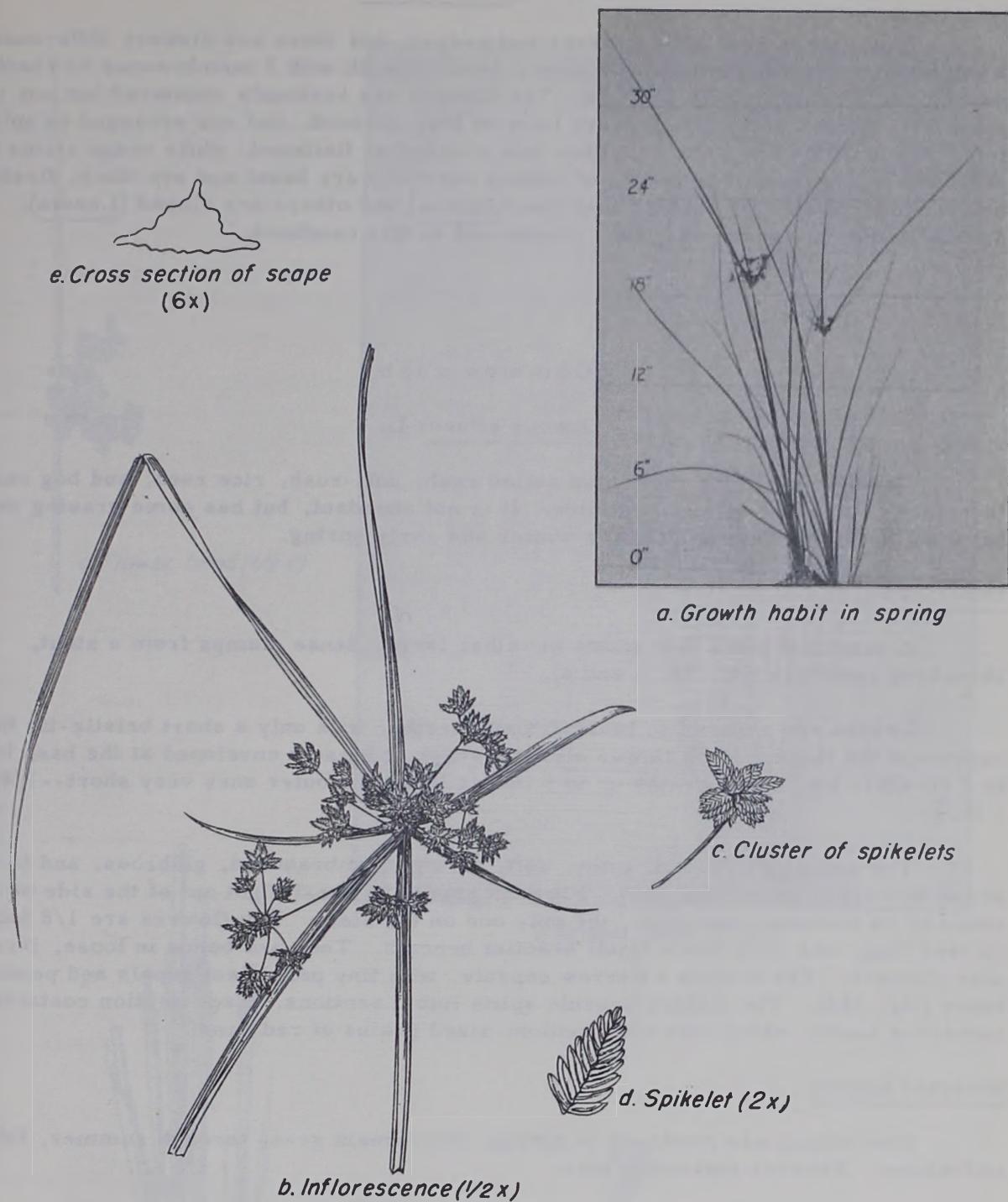


FIGURE 35-GREEN FLATSEDGE

RUSHES (JUNCACEAE)

The rushes resemble grasses and sedges, but there are distinct differences. Rush flowers are very small, and have a true perianth with 3 membranous or chaffy sepals and 3 nearly similar petals. The flowers are variously clustered but not in spikelets. Grass and sedge flowers have no true perianth, and are arranged in spikelets. Rush stems are pithy or hollow and rounded or flattened, while sedge stems are solid and triangular. The leaves of rushes normally are basal and are thick, fleshy, or rounded. Some leaf sheaths are open (*Juncus*) and others are closed (*Luzula*). *Juncus* is the only genus of rushes considered in this handbook.

Common rush

Juncus effusus L.

Common rush (fig. 36), also called rush, soft-rush, rice rush, and bog rush, is widely distributed on swampy sites. It is not abundant, but has some grazing value because the stems remain green in winter and early spring.

Description

A perennial plant that grows in rather large, dense clumps from a stout, branching rootstock (fig. 36, a and b).

Leaves are reduced to loose-fitting sheaths, with only a short bristle-tip to represent the blade. Each flower stem or scape is loosely enveloped at the base by 2 to 3 sheaths, the inner sheaths up to 5 inches long, the outer ones very short--1/4 to 1 inch.

The scapes are round, pithy, soft, straight, unbranched, glabrous, and tapered to a sharp point (fig. 36c). Flowers appear to burst right out of the side of the scape at an inconspicuous joint, the only one on the stem. The flowers are 1/8 inch or less long, and each has a small bractlet beneath. They are borne in loose, irregular clusters. The fruit is a narrow capsule, with tiny persistent sepals and petals below (fig. 36d). The mature capsule splits into 3 sections. Each section contains numerous seeds, which look like medium-sized grains of red sand.

Seasonal aspects

New scapes are produced in spring, and remain green through summer, fall, and winter. Flowers mature in May.

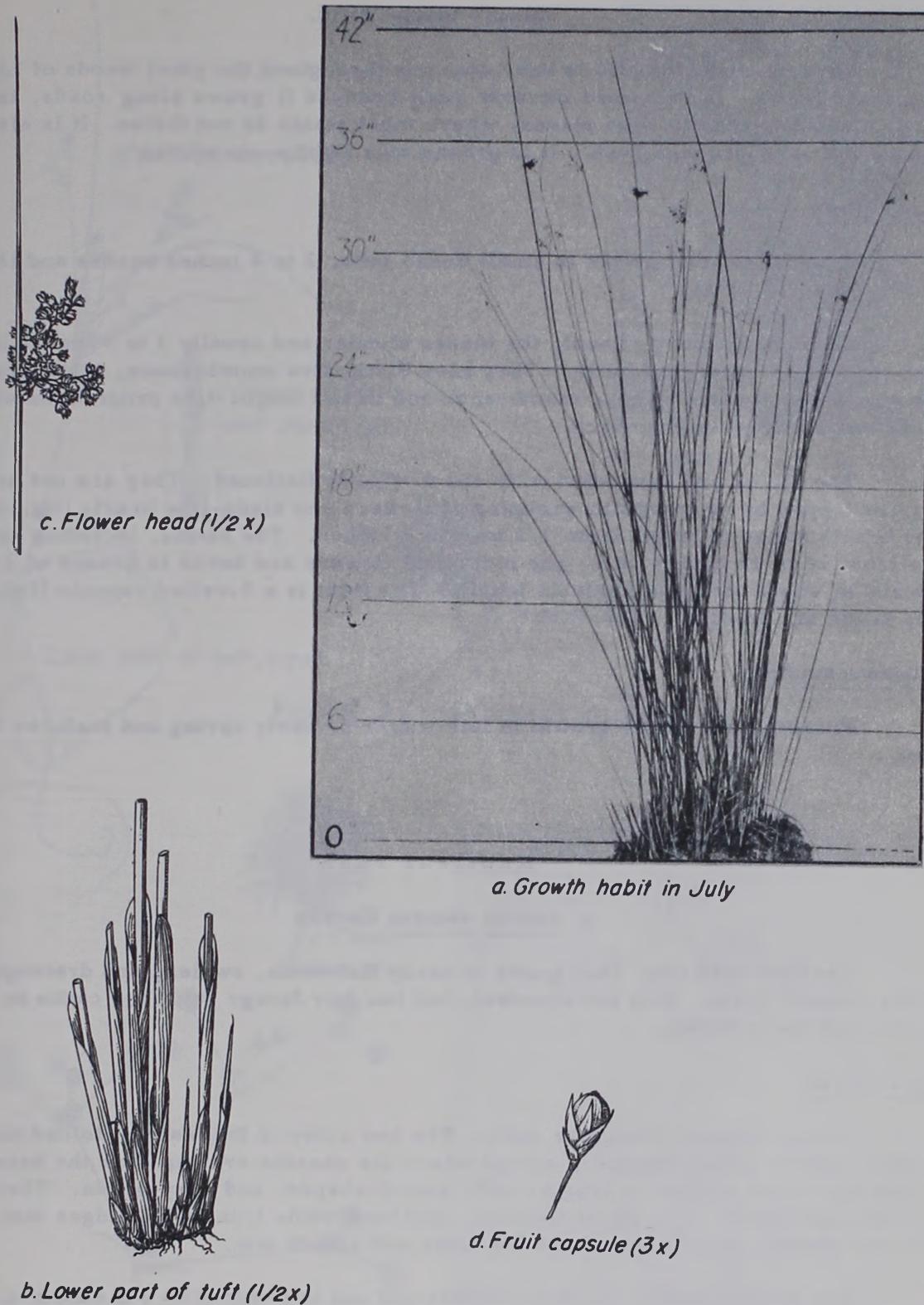


FIGURE 36.—COMMON RUSH.

Poverty rush

Juncus tenuis Willd.

Poverty rush (fig. 37) is very common throughout the piney woods of Louisiana and east Texas. It is named poverty rush because it grows along roads, trails, in yards and other heavily used places, where most plants do not thrive. It is also called hemp rush or wiregrass rush. It is grazed only lightly--in winter.

Description

A perennial that grows in small dense tufts, 2 to 4 inches across and 12 to 15 inches high (fig. 37a).

Leaves are mostly basal, the blades slender and usually 3 to 5 inches long. The sheaths are open and loose. They have distinctive membranous, translucent growths on each edge. These membranes end in two tongue-like projections where blade and sheath join (fig. 37c).

The stems are somewhat wiry and distinctly flattened. They are not branched, but are topped by an irregular grouping of flowers and blade-like bracts (fig. 37d). The bracts range in length from 1/2 inch to 6 inches. The stems, including bracts, are from 10 to 16 inches tall. The individual flowers are borne in groups of 2 to 3 at the end of small stalks of variable length. The fruit is a 3-celled capsule (fig. 37e). The seeds are dustlike.

Seasonal aspects

Poverty rush starts growth in late winter or early spring and matures fruit in May.

Knotleaf rush

Juncus validus Coville

Knotleaf rush (fig. 38a) grows in sandy flatwoods, swales, and drainage ways of the Coastal Plain. It is not abundant, but has fair forage value for cattle in late winter and early spring.

Description

Grows in small irregular tufts. The two sides of the leaf are folded on the midrib and are grown together, except where the sheaths overlap near the base. The blades are 1 foot or less in length, soft, sword-shaped, and gray-green. The sheaths are strongly folded, overlap at the base, and have white translucent edges that merge into ear-shaped projections where the blade and sheath join.

The stems grow 1-1/2 to 3-1/2 feet tall and are topped by a distinctive, widely branched inflorescence, with each branchlet bearing rounded flower heads (fig. 38b). The individual flower head (fig. 38c) is bur-like, green, about 1/2 inch in diameter, and contains 45 or more tiny flowers.

Seasonal aspects

Knotleaf rush produces succulent new leaves in late winter. During spring it looks like a small iris. Flower stems grow in late spring and mature in summer.

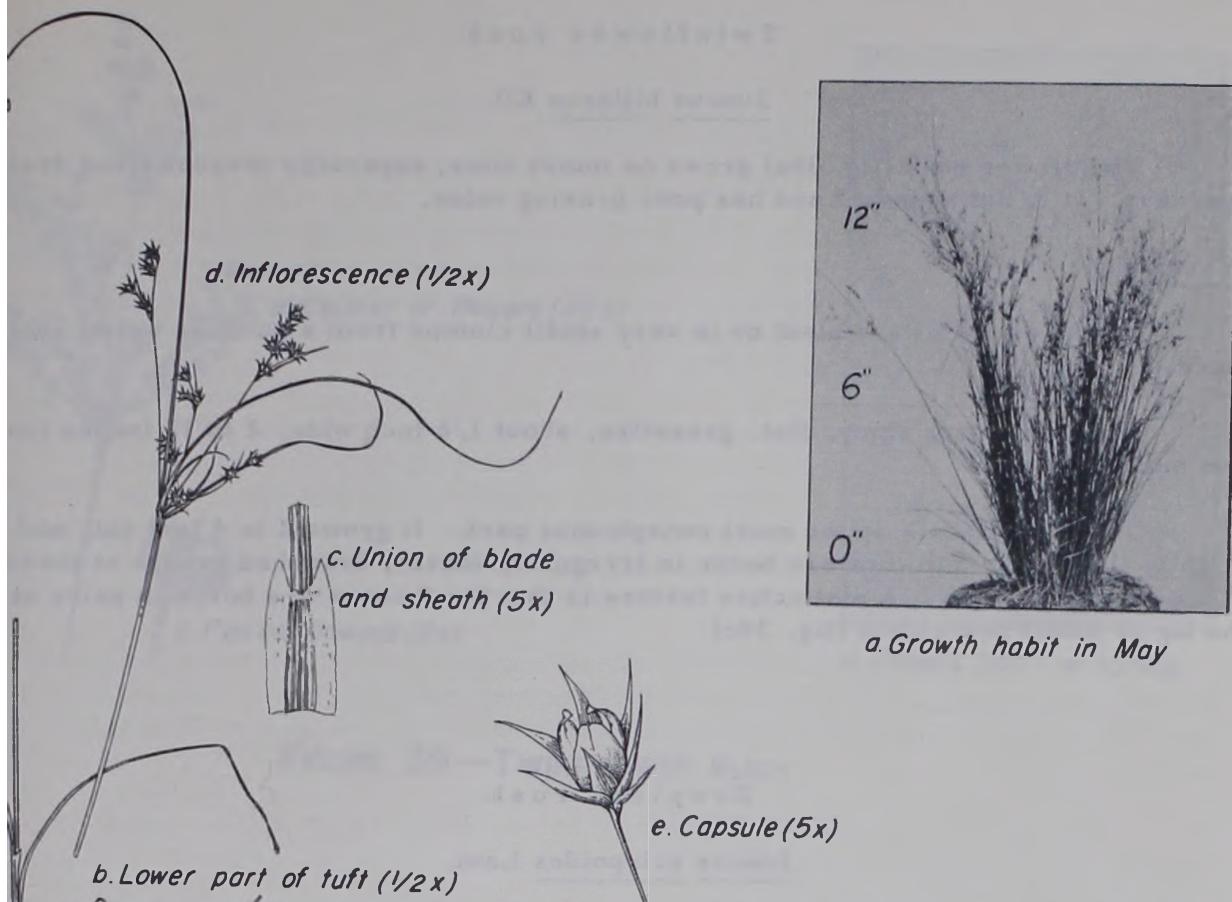


FIGURE 37.—POVERTY RUSH

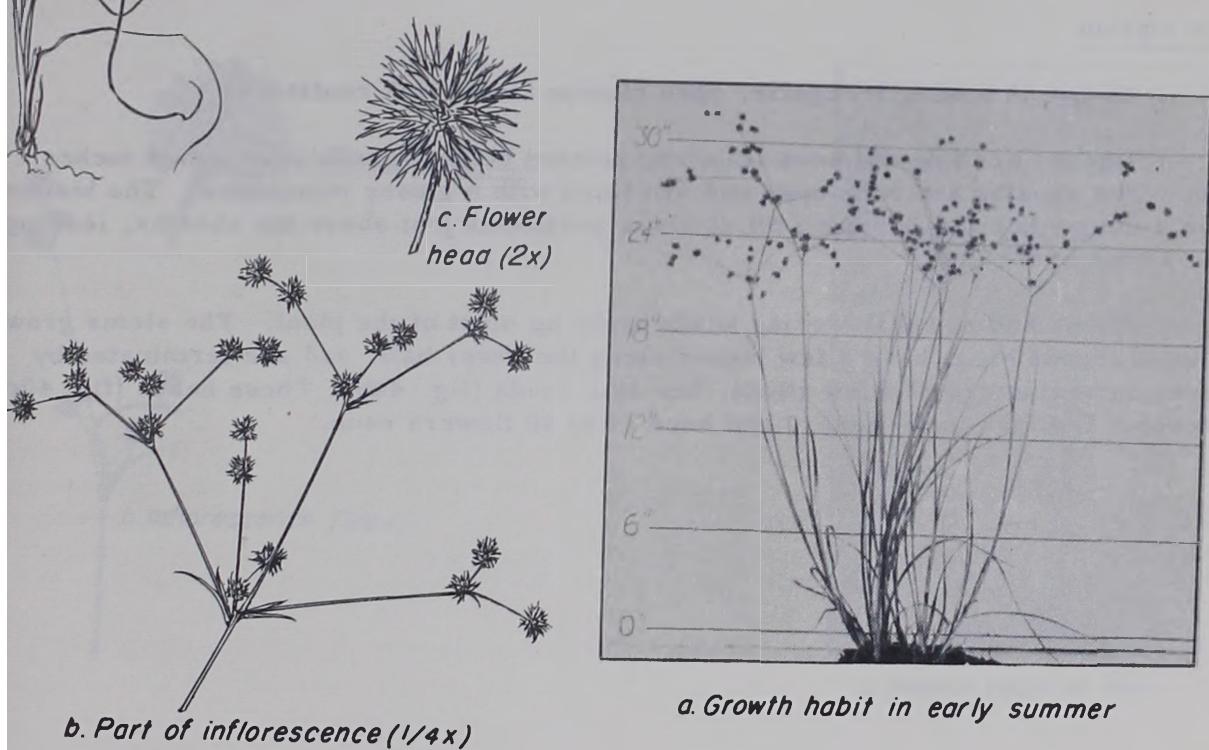


FIGURE 38.—KNOTLEAF RUSH.

Twinflower rush

Juncus biflorus Ell.

Twinflower rush (fig. 39a) grows on moist sites, especially meadows and drainage ways. It is not abundant and has poor grazing value.

Description

Grows as a solitary plant or in very small clumps from a bulblike woody rootstock.

The leaves are shiny, flat, grasslike, about 1/6 inch wide, 2 to 12 inches long, and mostly basal.

The flower stalk is the most conspicuous part. It grows 2 to 4 feet tall and slightly flattened. Flowers are borne in irregular, loosely branched groups at the top of the stem (fig. 39b). A distinctive feature is that the flowers are borne in pairs at the tip of small branchlets (fig. 39c).

Dropleaf rush

Juncus scirpoides Lam.

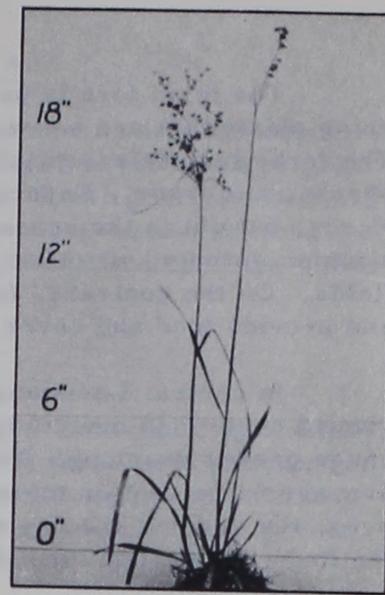
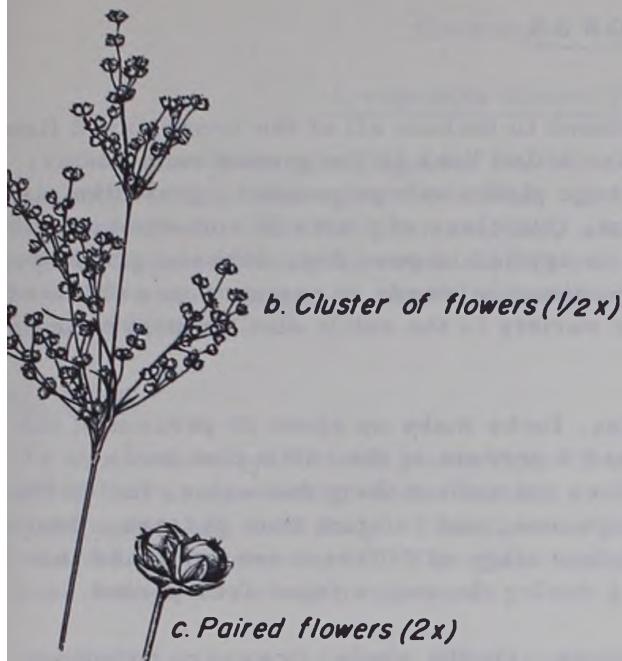
Dropleaf rush (fig. 40a) grows on moist sandy places, on riverbanks, and in swamps in the piney woods. It is not abundant and has little forage value.

Description

Grows in small, irregular, open clumps from thick rootstocks.

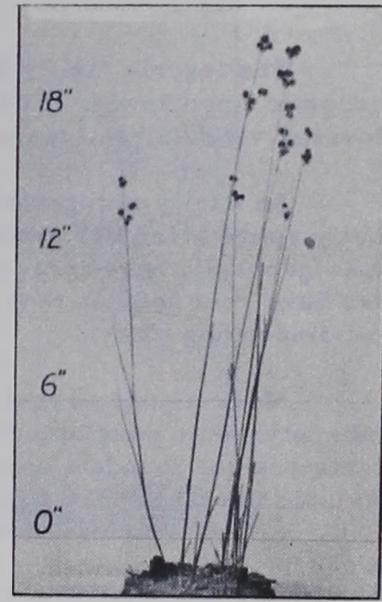
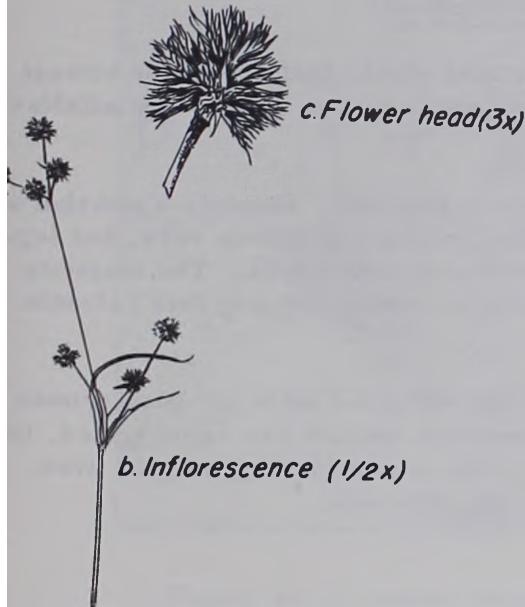
Leaves are few and have rounded, pointed blades mostly less than 8 inches long. The sheaths are wide open and are lined with a glossy membrane. The blades have a unique habit of dropping off at cross partitions just above the sheaths, leaving only a stub of the leaf.

Stems and round flowering heads make up most of the plant. The stems grow 18 to 40 inches high, have a few leaves along the lower half, and are terminated by loose, open clusters of a few round, bur-like heads (fig. 40b). These heads (fig. 40c) are about 1/4 inch in diameter, and have 15 to 40 flowers each.



a. Growth habit in spring

FIGURE 39.—TWINFLOWER RUSH



a. Growth habit in May

FIGURE 40.—DROPLEAF RUSH.

FORBS

The term forb is used in this handbook to include all of the broadleaved flowering plants that are not woody and that are killed back to the ground each winter. The forbs include essentially all forest range plants except grasses, grasslike plants, shrubs, and trees. Especially in the West, this class of plants is sometimes termed weeds, but not in the sense that the word is applied to poor Joe, Johnson grass, persimmon sprouts, or other noxious or objectionable weeds in pastures or cultivated fields. On the contrary, forbs contribute variety to the cattle diet, improve the soil, and provide food and cover for wildlife.

In central Louisiana and east Texas, forbs make up about 20 percent of the ground cover. In one study they comprised 4 percent of the cattle diet on forest range grazed yearlong. This 4 percent does not reflect their full value, for on the average forbs contain more protein, phosphorus, and calcium than grasses. Moreover, the various species reach the succulent stage at different seasons, and thus the forbs as a group furnish some grazing during the entire frost-free period.

Some forbs are poisonous to livestock. On the whole, however, poisonous plants do not appear very troublesome on the piney woods ranges of this area. It may be that more livestock are poisoned than is realized, but few cases are reported.

The majority of the forbs discussed herein are in two families: the legumes (Leguminosae), and the composites (Compositae).

LEGUMES (LEGUMINOSEAE)

The legume family is enormous, and contains plants that are of the utmost economic importance. Peas, beans, and peanuts are legumes, and so are alfalfas, clovers, vetches, and lespedezas.

An easily recognized feature of the family is the fruit, which is a pod that usually splits along two seams when it dries. The flowers and leaves vary, but legumes generally have irregular showy blooms and compound leaves. The majority also have root nodules that contain nitrogen-fixing bacteria, and are thus valuable soil-improving plants.

Most legumes require slightly alkaline, well-drained soils for good growth and root-nodule development. Thus, though numerous species are represented, the plants are not abundant on the usually acid soil of the cut-over longleaf pine area. Periodic burning of the range appears to benefit the legumes.

Common lespedeza

Lespedeza striata (Thunb.) H. & A.

Common lespedeza (fig. 41) is a small but valuable annual legume imported from eastern Asia before the Civil War. It is now widely used in the South to plant in fields of low fertility for pasture, hay, and soil building. Though it has become widely distributed (being disseminated in cattle dung), it is not abundant in woodland areas. On some ranges it provides about one percent of the cattle diet. The seeds are prized by quail.

Description

A small annual that grows from 3 to 12 inches high. It is made up of many slender, hairy, spreading, leafy branches. The leaves have three oval leaflets that are just under 1/2-inch long. The flowers are about 1/4 inch long, purple or pink, and shaped like a sweetpea. The plant can produce seed even when closely grazed, because some stems hug the ground.

Common lespedeza is a slow-growing plant in the spring, but develops more rapidly in the latter part of the summer and makes choice grazing in late summer and fall.

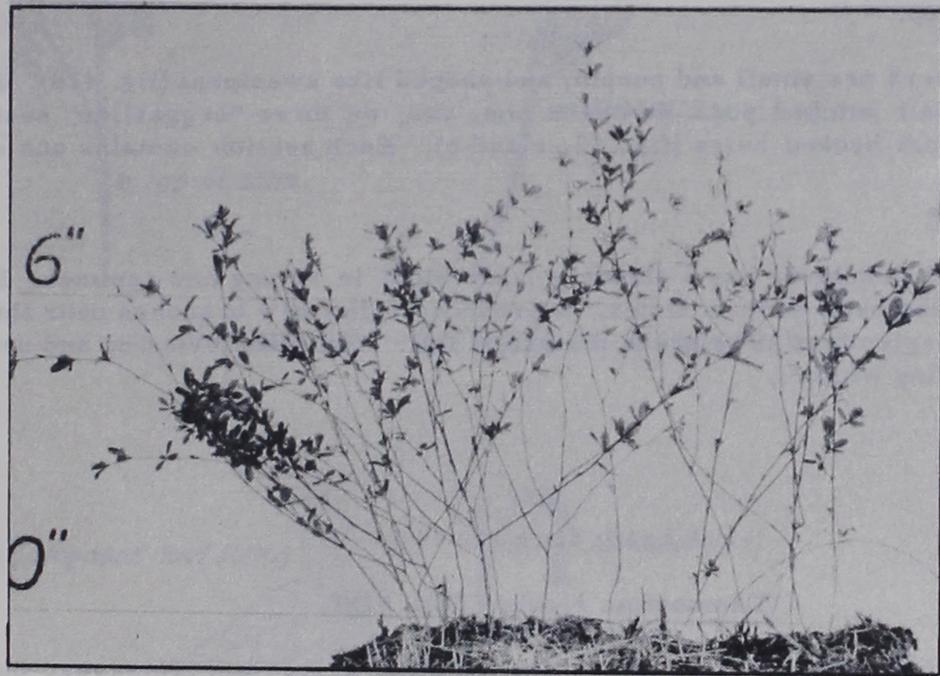


Figure 41.—Common lespedeza: Growth habit in October.

Littleleaf tickclover

Desmodium ciliare DC.

Littleleaf tickclover (fig. 42) grows scattered throughout the piney woods, particularly on well-drained upland areas. It is one of several closely related plants commonly called tickclovers or beggarlice because the small, jointed, flat seed pods stick to clothing, hair, and wool. Herbage samples taken in late spring showed this plant to have more crude protein and much more calcium than associated grasses. On some ranges it comprises one to two percent of the forage eaten by cattle and makes a nutritious variation to the usual diet of grasses. The seeds are an important food for quail, particularly when the mast crop is poor. Deer feed on the flower stems and seed heads in late summer and fall.

Description

An erect perennial herb that grows from rootstocks. The plant is made up of one or two slender stems that have few branches (fig. 42a).

The leaves are compound, being made up of three oval to round leaflets 1/2 inch or less in length (fig. 42b). The end leaflet is a little longer than the other two. Each leaflet is on a small stalk. The leaf edges are rough-fringed with small, curved, stiff hairs.

The stems grow 2 to 3 feet high and are slender and upright. The numerous glandular hooked hairs or spines make the stems sticky to touch. Branching is very irregular. The main stem often breaks or is grazed off. When this happens the side branches shoot up.

The flowers are small and purple, and shaped like sweetpeas (fig. 42d). They mature into small notched pods that have one, two, or three "beggarlice" sections covered with short hooked hairs (fig. 42, c and e). Each section contains one seed.

Seasonal aspects

Littleleaf tickclover has a slender, leafy stem in spring and summer. Even though it is grazed back several times, it produces a few new branches near the top and flowers in September. The seeds mature in fall. The plant dries up and usually breaks over during winter.

Rigid tickclover

Desmodium rigidum (Ell.) DC.

Rigid tickclover looks very much like littleleaf tickclover. However, the stem is stiffer and less hairy and therefore is not sticky to touch--it is often smooth below. The leaves are larger and tend to be long-ovate (fig. 43a) instead of rounded, and the pods are less hairy (fig. 43b). The plant is not as common as littleleaf tickclover.

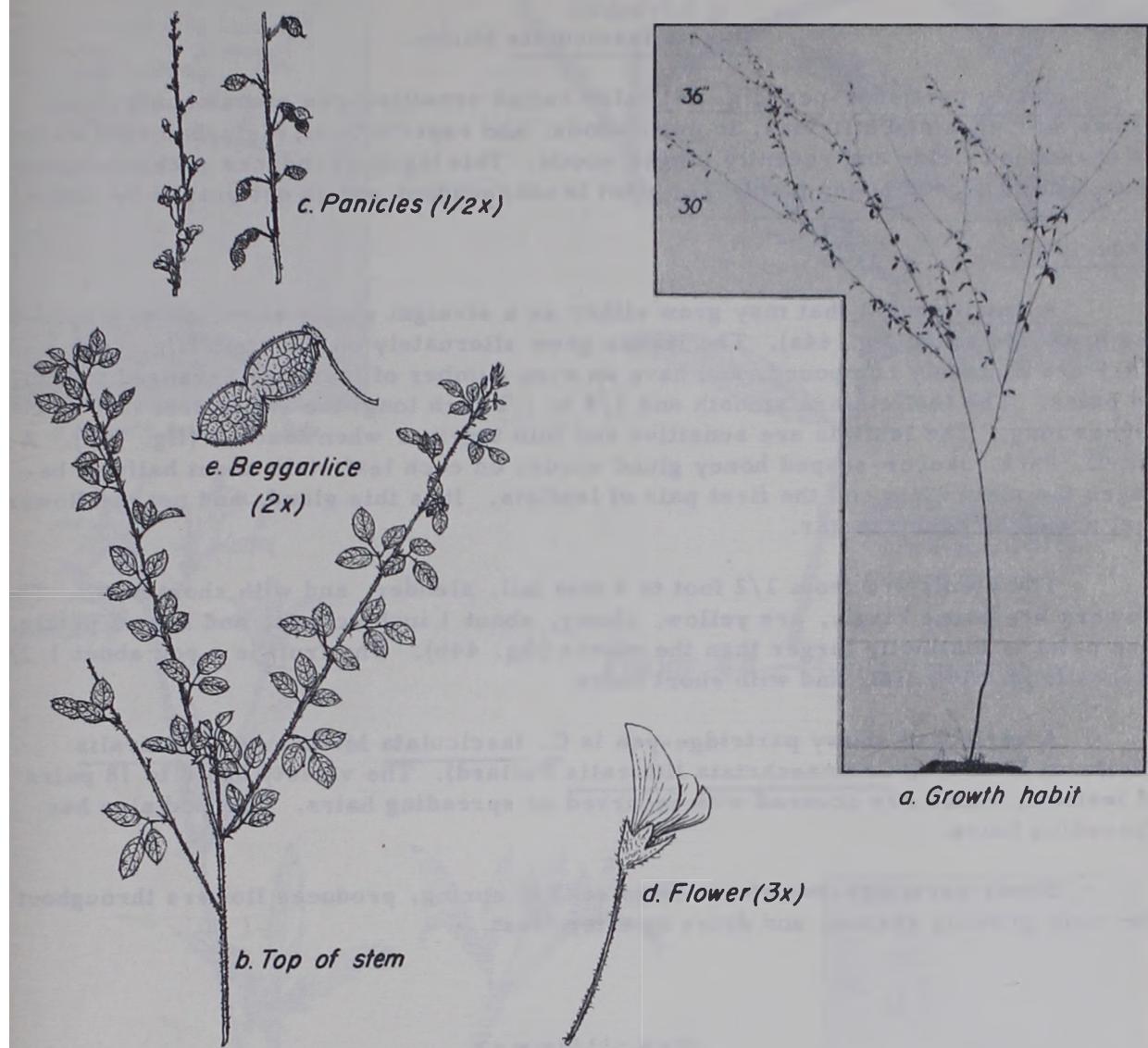


FIGURE 42.—LITTLELEAF TICKCLOVER.

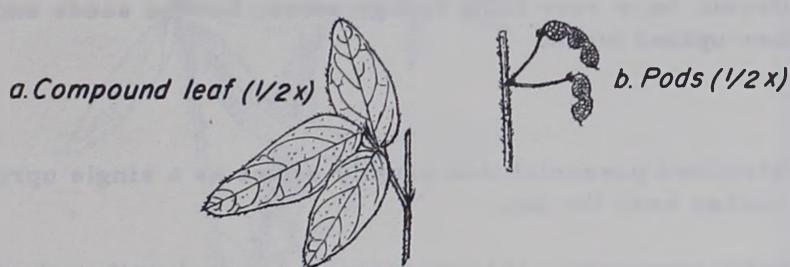


FIGURE 43.—RIGID TICKCLOVER.

Showy partridge-pea

Cassia fasciculata Michx.

Showy partridge-pea (fig. 44), also called sensitive-pea and sleeping plant, grows on ridges and hillsides, in open woods, and especially on disturbed areas such as abandoned fields and recently logged woods. This legume produces excellent quail food, and is a good honey plant. The plant is not abundant and is not grazed by cattle.

Description

A small annual that may grow either as a straight single stem, or as a spreading branched stem (fig. 44a). The leaves grow alternately on the stem (fig. 44b). They are pinnately compound, and have an even number of leaflets, arranged in 6 to 12 pairs. The leaflets are smooth and 1/4 to 1/2 inch long; the entire leaf is 1 to 2 inches long. The leaflets are sensitive and fold together when touched (fig. 44c). A small, dark, saucer-shaped honey gland occurs on each leaf stalk about halfway between the main stem and the first pair of leaflets. It is this gland, and not the flower, that produces honey nectar.

The stems are from 1/2 foot to 3 feet tall, slender, and with short hairs. The flowers are borne singly, are yellow, showy, about 1 inch across, and have 5 petals. One petal is distinctly larger than the others (fig. 44b). The fruit is a pod about 1-1/2 inches long, very flat, and with short hairs.

A variety of showy partridge-pea is *C. fasciculata* Michx. var. *littoralis* (Pollard) Macbr. (=*Chamaecrista littoralis* Pollard). The variety has 8 to 18 pairs of leaflets, which are covered with incurved or spreading hairs. The pod also has spreading hairs.

Showy partridge-pea starts from seed in spring, produces flowers throughout the main growing season, and dries up after frost.

Pencilflower

Stylosanthes biflora (L.) B.S.P.

Pencilflower (fig. 45) is widely distributed in the piney woods area, particularly on sandy soils. It is associated with pinehill and other bluestems. The plants, which are small and scattered, have very little forage value, but the seeds and pods are eaten by quail and other upland birds.

Description

A slender, wiry-stemmed perennial that usually grows as a single upright stem with a few short branches near the top.

The leaf is palmately compound. It is made up of 3 prominently veined leaflets that are 3/8 inch to 1-3/8 inches long and a sheathing stipule that is tipped by a branching spidery bristle. At first glance this plant resembles common lespedeza, but its leaves are almost lanceolate, while those of lespedeza are oval.

The usually erect stems vary from 1/2 foot to 2 feet tall, and are conspicuously hairy. They may branch near the ground but more often grow singly. The plant has two kinds of small flowers; the one with yellow petals (fig. 45b) is sterile, while the one without petals produces a small (1/4 inch), round, single-seeded pod. It blooms in spring and summer and matures fruit in summer and fall.



a. Growth habit in July

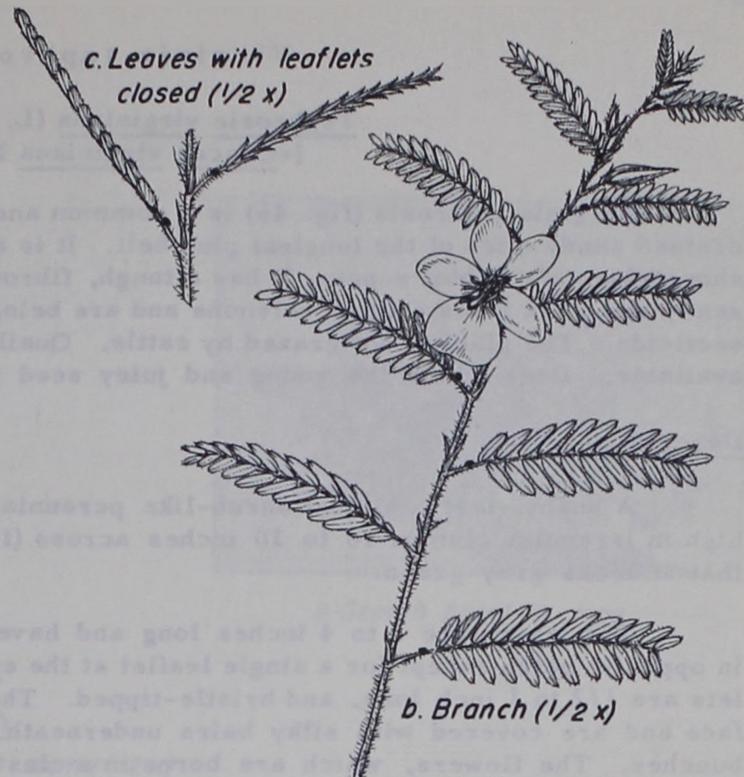
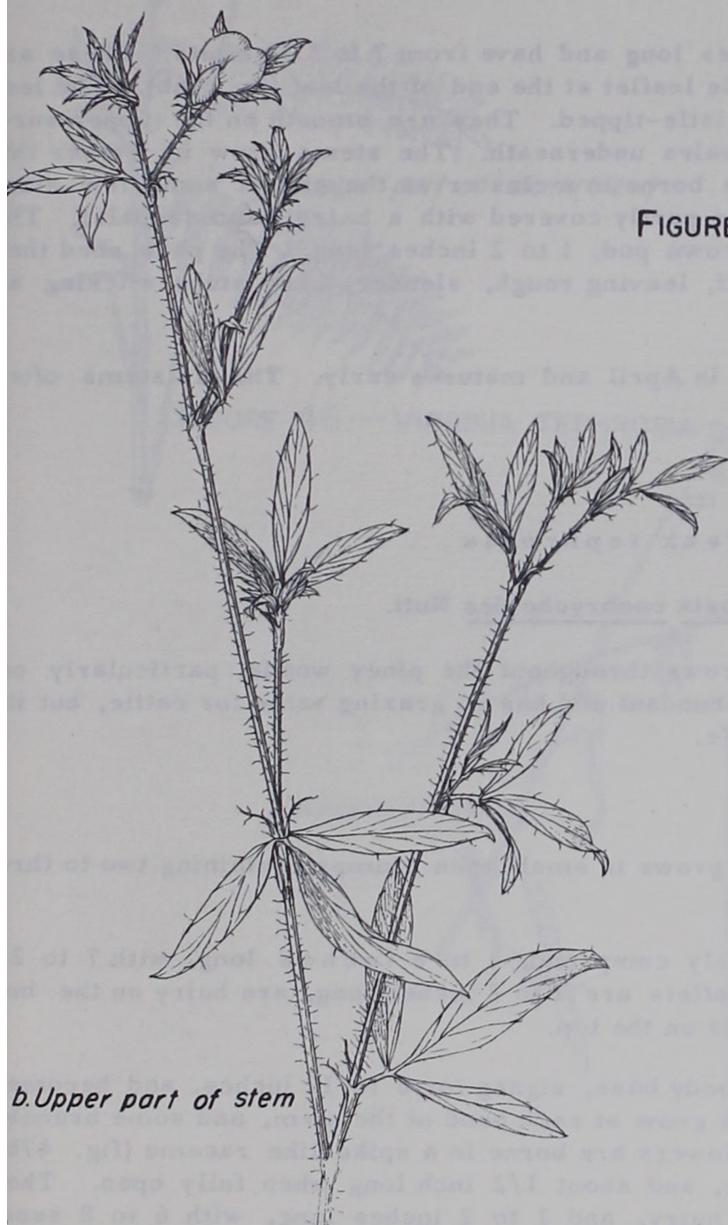
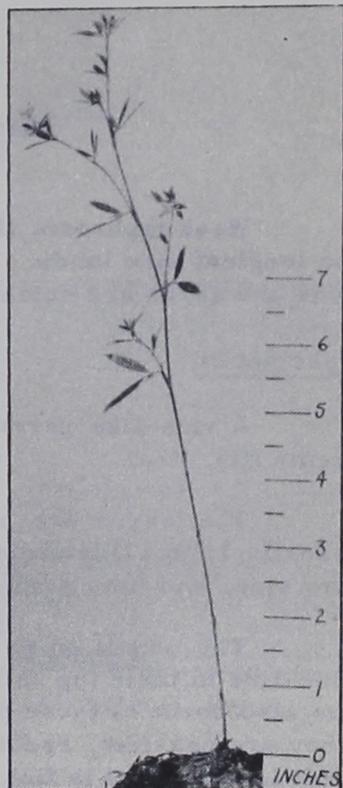


FIGURE 44.—SHOWY PARTRIDGE-PEA.



b. Upper part of stem



a. Growth habit in July

FIGURE 45.—PENCILFLOWER.

Virginia tephrosia

Tephrosia virginiana (L.) Pers.
(=Cracca virginiana L.)

Virginia tephrosia (fig. 46) is a common and sometimes abundant forb on well-drained sandy sites of the longleaf pine belt. It is also called cat-gut, goatsrue, devil's shoestring, and rabbit's-pea. It has a tough, fibrous root system well suited to bind sandy soil. Its roots contain rotenone and are being considered as a source of this insecticide. The plant is not grazed by cattle. Quail eat the seeds if better food is unavailable. Deer nibble the young and juicy seed pods.

Description

A bushy, leafy, almost shrub-like perennial that grows from 10 to 20 inches high in irregular clumps 10 to 30 inches across (fig. 46a). The plant is so hairy that it looks gray-green.

The leaves are 2 to 4 inches long and have from 7 to 31 leaflets. These are in opposite pairs except for a single leaflet at the end of the leaf (fig. 46b). The leaflets are 1/2 to 1 inch long, and bristle-tipped. They are smooth on the upper surface and are covered with silky hairs underneath. The stems grow in rather thick bunches. The flowers, which are borne in a cluster at the end of some few stems, are pink to purple-yellow, but are partly covered with a hairy calyx (sepals). The fruit is a slender, hairy, gray-brown pod, 1 to 2 inches long. The pods shed their seeds in July. Later they drop off, leaving rough, slender, bare stubs sticking above the main plant.

Virginia tephrosia blooms in April and matures early. The old stems often last through the winter.

Weak tephrosia

Tephrosia onobrychoides Nutt.

Weak tephrosia (fig. 47) grows throughout the piney woods, particularly on the longleaf pine lands. It is not abundant and has no grazing value for cattle, but its pods and seeds are eaten by wildlife.

Description

A vine-like perennial that grows in small open clumps containing two to three stems (fig. 47a).

The leaves are odd-pinnately compound, 4 to 8 inches long, with 7 to 25 (usually 11 to 17) leaflets. The leaflets are 1 to 2 inches long, are hairy on the bottom side, and have prominent veins on the top.

The stems arise from a woody base, zigzag for 6 to 12 inches, and become vine-like in their top half. Leaves grow at each bend of the stem, and some branches are also borne at these points. Flowers are borne in a spike-like raceme (fig. 47b). They are pea-like, reddish-purple, and about 1/2 inch long when fully open. The fruit is a pod that is flat, linear, hairy, and 1 to 2 inches long, with 6 to 8 seeds.

The plant blooms in spring and early summer and often has flowers and mature pods on the same stem. The leaves shed in summer and the stem dries up in fall.

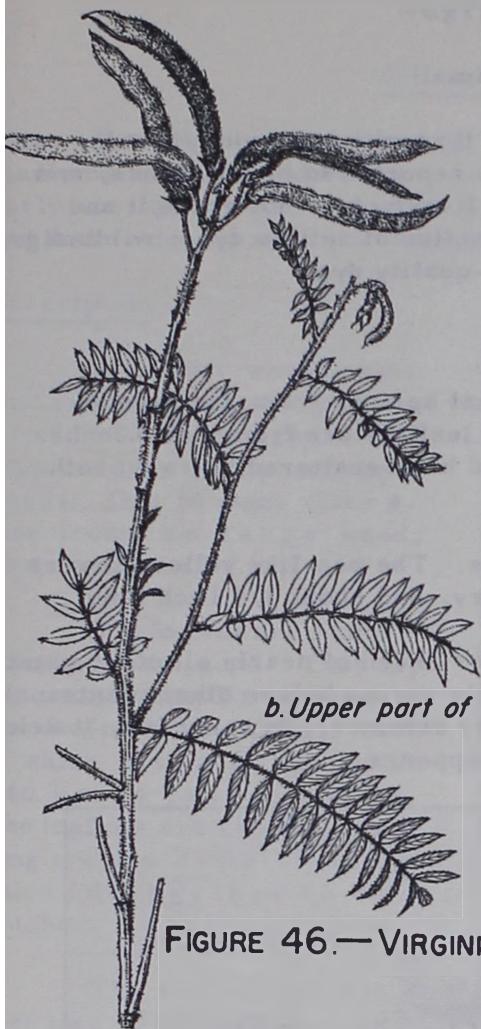
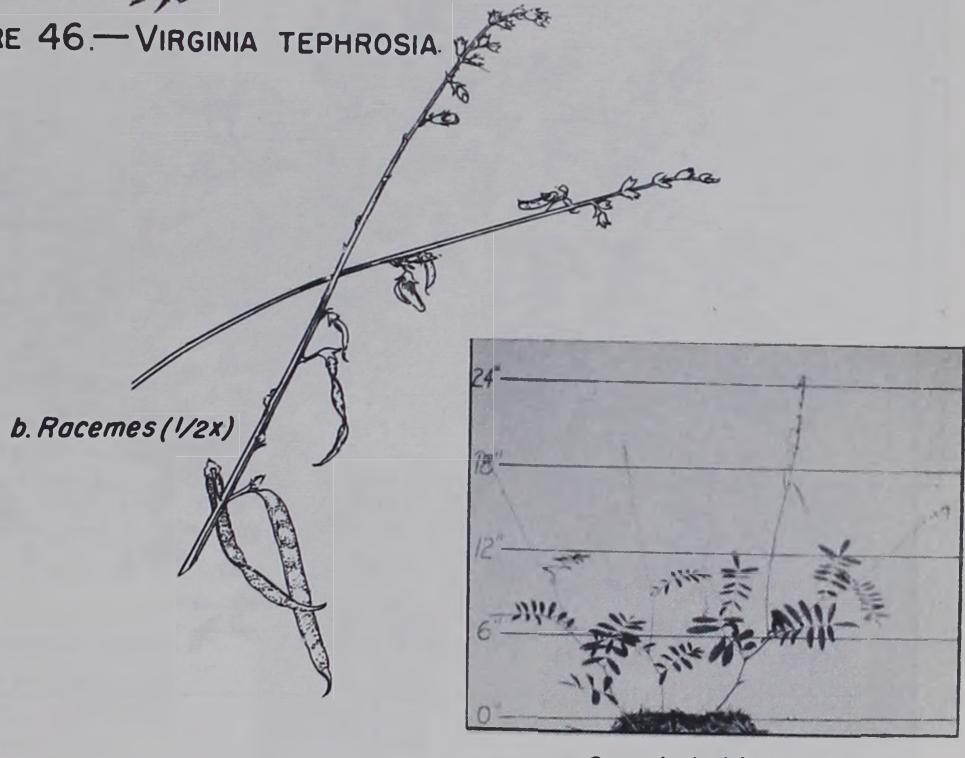


FIGURE 46.—VIRGINIA TEPHROSIA.



a. Growth habit in June



a. Growth habit in July

FIGURE 47.—WEAK TEPHROSIA.

Nuttall wildindigo

Baptisia nuttalliana Small

Nuttall wildindigo (fig. 48) grows scattered throughout the piney woods, particularly on sandy soils. Some related species are reported to be poisonous, and therefore Nuttall wildindigo is suspect. However, livestock do not graze it and there are no records of losses. Before the introduction of aniline dyes, wildindigo, like its relative true indigo, was used to make low-quality dye.

Description

A fast-growing bushy-branched perennial that springs from stout woody rootstocks. The leaves are compound. The three leaflets are from 1 to 3 inches long, glossy on the upper side and dull beneath, and have scattered hairs on both surfaces.

The plant reaches a height of 18 to 36 inches. The pea-like yellow flowers are about $3/4$ inch long. The pod is oval, very hairy, and about $3/4$ inch long.

Nuttall wildindigo starts growth in late winter ahead of nearly all other plants. It grows rapidly and is very conspicuous during early spring before other plants make a showing. It blooms in spring and matures in early summer. In early fall, it dries up, turns bluish-black (indigo), breaks off, and disappears.



Figure 48. --Nuttall wildindigo: Growth habit in July.

Nuttall sensitivebrier

Schrunkia nuttallii (DC.) Standl.

Nuttall sensitivebrier (fig. 49) is widely distributed in open pinelands, particularly on well-drained or dry sites. Cattle graze the tender twigs for a few weeks in early spring, at which time the foliage is highly nutritious. Deer browse the stems and leaves during spring and summer, and quail eat the seeds.

Description

A thorny, woody, perennial vine that usually trails 4 to 8 inches above ground, supported by grasses and weeds. One to many vines arise from the large woody rootstock.

The leaves are double-pinnately compound. That is, the petiole has 3 to 6 pairs of pinnae (main divisions), each of which in turn is subdivided into 8 to 14 pairs of leaflets. The leaflets are about 1/8 inch long and are sensitive--the pairs fold together on being touched.

The stems are 2 to 4 feet long, yellowish, and clothed with sharp, hooked prickles. Conspicuous ridges run lengthwise along the stem. The inflorescence consists of round balls or heads about 3/4 inch across. Each head contains many small pink or red flowers. The pod is very prickly, four-angled, and 1 to 3 inches long. It splits open at the four corners to release the seeds.

Seasonal aspects

Nuttall sensitivebrier blooms in May and June and matures in summer. The old vines last for a year.

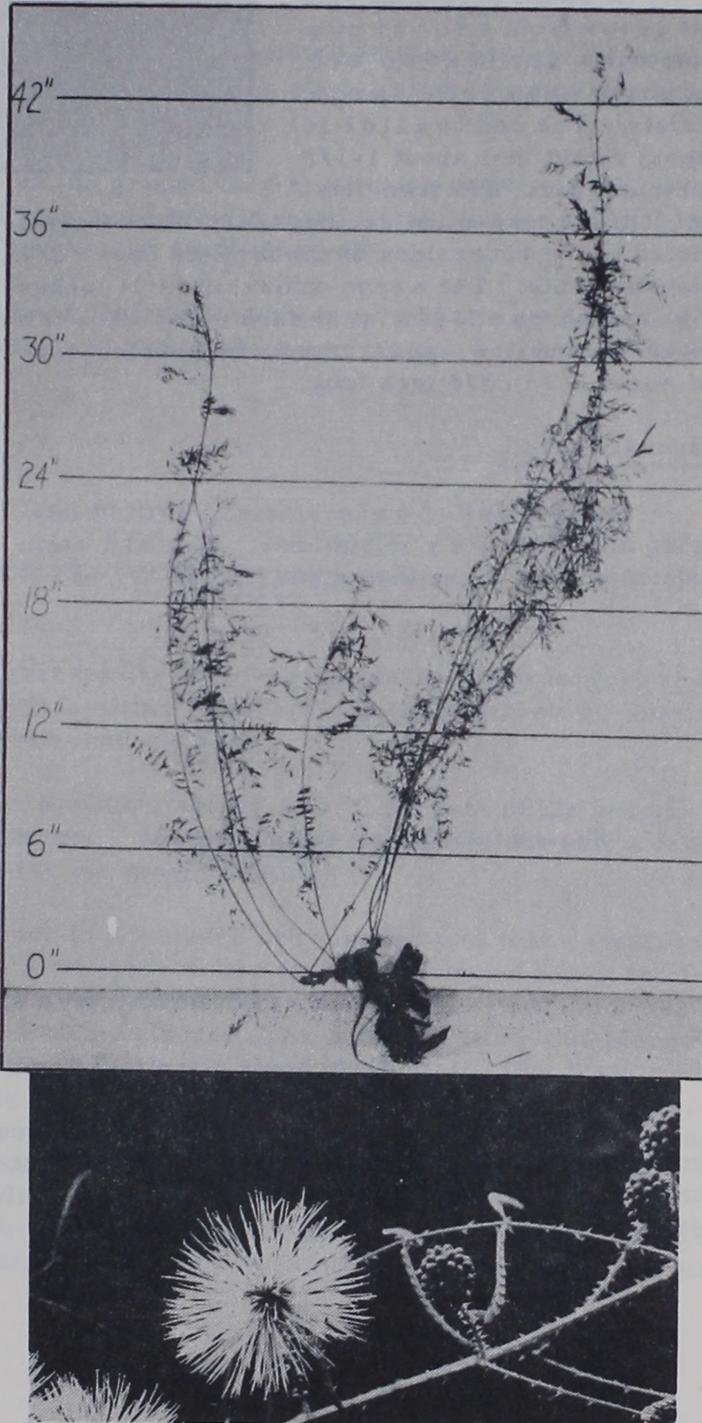


Figure 49. --Nuttall sensitivebrier.
 Above: Growth habit in July.
 Below: Flower heads.

Hairy rhynchosia

Rhynchosia difformis (Ell.) DC.

Hairy rhynchosia (fig. 50) grows as scattered plants in the longleaf pine belt. It has very little forage value, but furnishes some food for quail.

Description

A small perennial vine that grows from a tuberous rootstock. The leaves are compound with three large leaflets. The end leaflet is almost round and about 1-1/2 inches across. The two lateral leaflets are smaller, egg-shaped, and more pointed. The undersides of the leaflets have conspicuous veins. The stem grows 12 to 24 inches long, and bends slightly at each node. The few flowers are yellow, pea-shaped, inconspicuous, and about 1/2 to 3/4 inch long.

Seasonal aspects

Hairy rhynchosia starts growth in late spring and matures in summer. The old stem frequently lasts more than a year.

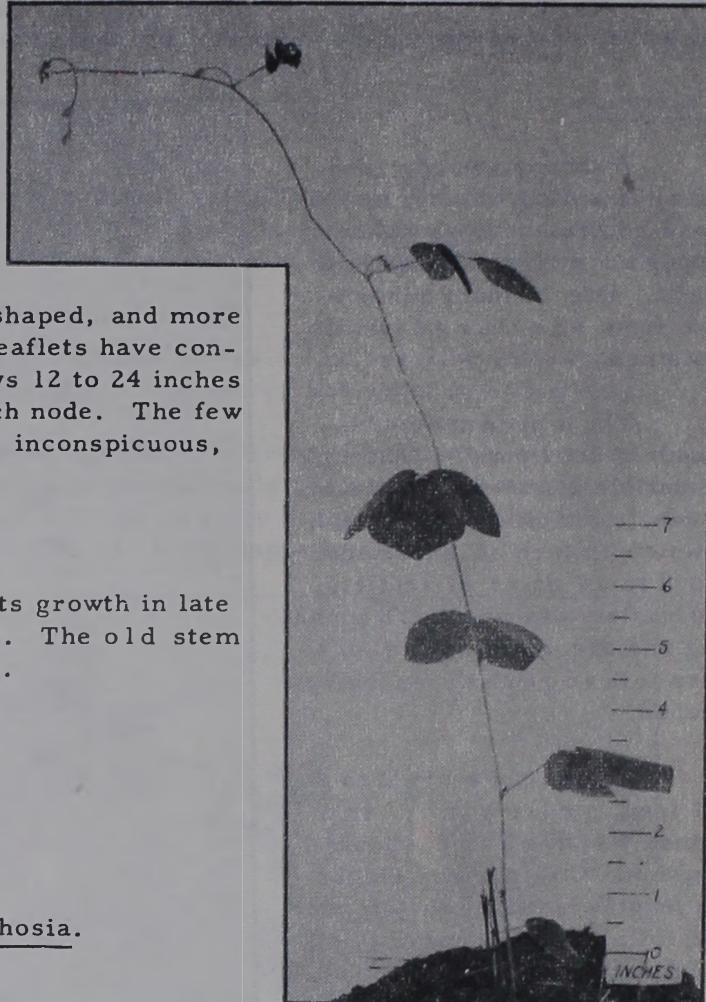


Figure 50.--Hairy rhynchosia.

Dollarleaf rhynchosia

Rhynchosia simplicifolia (Walt.) Wood

Dollarleaf rhynchosia is a low, yellow-flowered perennial similar to hairy rhynchosia, but smaller, and with a nearly upright stem and a simple leaf--not compound. The leaf is about the size and shape of a silver dollar. The stem is 3 to 9 inches high.

Arrow crotalaria

Crotalaria sagittalis L.

Arrow crotalaria grows in the pinelands, especially along drainages and sandy stream banks. It is scarce--which is fortunate because its seeds are poisonous to livestock, particularly horses.

Description

Grows upright as a single stem for 3 to 6 inches and then branches into several stems. Total height is 8 to 12 inches. It is an annual plant in some northern States but is usually perennial in Louisiana.

The leaves are simple. Near the ground they are mostly oval, but those further up the plant are narrow and long and have conspicuous arrow-shaped stipules extending down their stems. The flowers are small and yellow.

The pod is dark brown, rounded, inflated, oblong, and about 1 inch long by 3/8 inch wide. The seeds come loose and rattle around in the pod before it opens.

COMPOSITES (COMPOSITAE)

The composites are the largest family of flowering plants--even larger than the legume family. Some of the most familiar members are the sunflowers, asters, chrysanthemums, daisies, goldenrods, and zinnias.

On longleaf pine ranges, composites make up 8 to 12 percent of the ground cover and 1 to 3 percent of the cattle diet. Many species are found, but only a few are grazed; swamp sunflower is by far the most valuable.

In this family the inflorescence is a rounded head made up of many small individual flowers closely grouped on a receptacle--the flared, thickened top of the flower stalk. The receptacle is either flat-topped, dome-shaped, or conical, and has on its sides a ring of leafy bracts called an involucre. The outer, usually conspicuous, petal-like parts are individual blooms called ray flowers (fig. 5le). The main or central part of the head contains the short, closely-packed individual disk flowers. Some species, as the dandelion, have ray flowers only, and others are composed entirely of disk flowers, but most species have both kinds.

In many composites a brush-like cluster of bristles (pappus) is attached to the top of the achene, and aids in scattering the seed. A familiar example is the mature dandelion head.

Swamp sunflower

Helianthus angustifolius L.

Swamp sunflower (fig. 51) is the most heavily grazed forb on forest ranges of this area. It is widely distributed on both moist and dry sites. It contributes about 5 percent of the ground cover and 1 to 2 percent of the cattle diet on ranges of central Louisiana. Herbage samples taken in June showed swamp sunflower to have more crude protein and phosphorus than the associated grasses, and 5 times as much calcium. Cattle graze swamp sunflower in spring, but mostly in summer and fall. Even though the plants are grazed repeatedly, they still produce flower stalks. The flower heads are often grazed eagerly by cattle in fall, as soon as the buds open. Young stems are also grazed by deer; the seeds are eaten by quail and doves.

Description

A large rough-hairy perennial that starts growth in spring from a thick root crown (fig. 51, a and c). It most often grows as a single-stemmed plant, but two or more stems may come from the same root crown.

The leaves (fig. 51d) are almost fleshy but slender, 1/4 inch wide and up to 7 inches long. The margins roll back toward a prominent, enlarged midrib. The leaves are rough and sticky because of the many short stiff hairs which project from small conical bumps or pustules.

The rough stems grow upward 1/2 foot to 2 feet, then branch. The total height ranges from 1 to 7 feet. On very favorable sites the plant is much-branched and bushy. Each small top branch is tipped by a single, showy flower head (fig. 51e). The heads are almost 2 inches broad and have an outer ring of bright yellow ray flowers and a center of reddish-brown disk flowers. The rays are three-toothed, about 3/4 inch long, and have yellow dots underneath. The involucre has 3 to 4 rings of thin, hairy, overlapping, green bracts. Only the disk flowers produce achenes.

Seasonal aspects

In late winter and early spring, swamp sunflower is a simple rosette of fairly broad short leaves. A short stem with narrow leaves is usually present in May and June. This stem grows up and branches in summer and produces flower heads in fall. The stems gradually deteriorate and break over in winter.

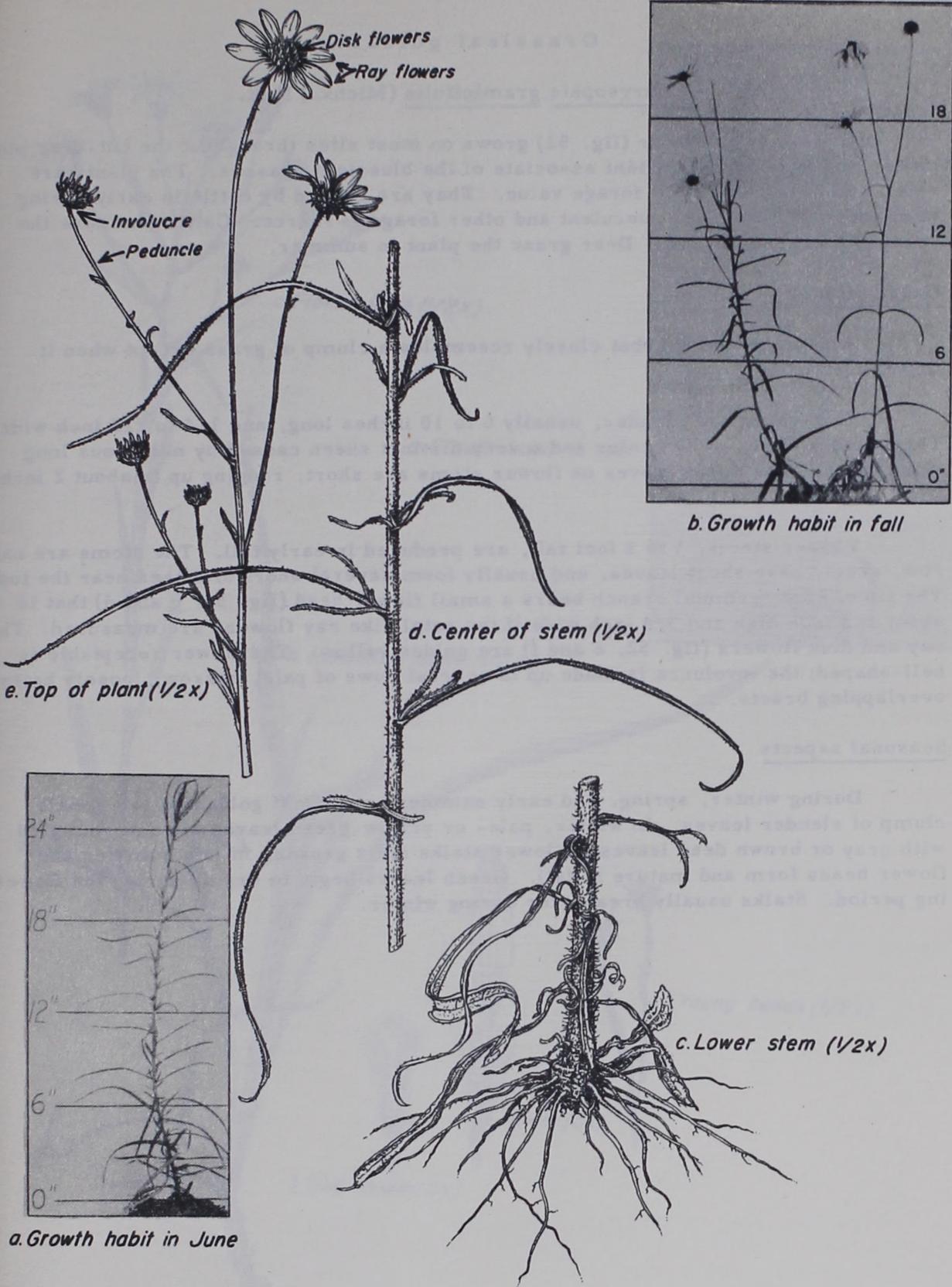


FIGURE 51.—SWAMP SUNFLOWER.

Grassleaf goldaster

Chrysopsis graminifolia (Michx.) Nutt.

Grassleaf goldaster (fig. 52) grows on most sites throughout the cut-over pine-lands, and is a fairly constant associate of the bluestem grasses. The plants are small and have rather low forage value. They are grazed by cattle in early spring when they are young and succulent and other forage is scarce. Cattle also take the young flowerheads in fall. Deer graze the plant in summer.

Description

A small perennial that closely resembles a clump of grass except when it flowers (fig. 52b).

The leaves are slender, usually 6 to 10 inches long, and 1/4 to 1/2 inch wide. They have a silver-green color and a very distinct sheen caused by numerous long silky hairs. The upper leaves on flower stems are short, ranging up to about 2 inches (fig. 52c).

Flower stems, 1 to 3 feet tall, are produced in early fall. The stems are narrow, erect, have short leaves, and usually form several short branches near the top. The tip of each terminal branch bears a small flower head (fig. 52, c and d) that is about 1/2 inch high and 3/4 inch wide if the petal-like ray flowers are measured. The ray and disk flowers (fig. 52, e and f) are golden yellow. The flower receptacle is bell-shaped; the involucre is made up of several rows of pale, narrow, loosely hairy, overlapping bracts.

Seasonal aspects

During winter, spring, and early summer, grassleaf goldaster is a small clump of slender leaves. In winter, pale- or yellow-green leaves are intermingled with gray or brown dead leaves. Flower stalks start growing in late summer and flower heads form and mature in fall. Green leaves begin to dry up during the flowering period. Stalks usually break over during winter.

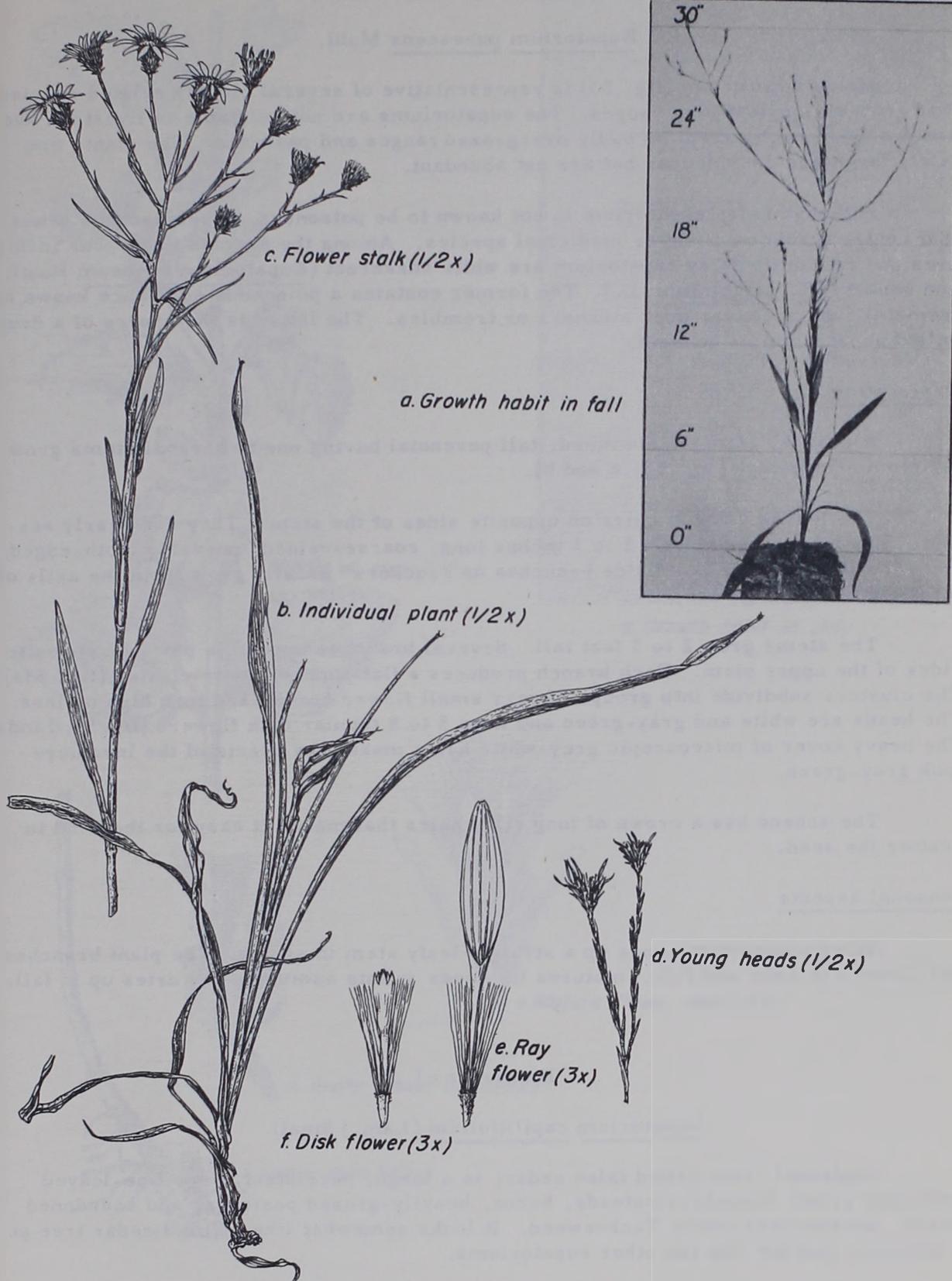


FIGURE 52.—GRASSLEAF GOLDASTER.

Hairy eupatorium

Eupatorium pubescens Muhl.

Hairy eupatorium (fig. 53) is representative of several closely related species that grow on longleaf pine ranges. The eupatoriums are not palatable to livestock and are not used much except on badly overgrazed ranges and pastures. The plants are fairly large and conspicuous but are not abundant.

Although hairy eupatorium is not known to be poisonous, it belongs to a genus that contains several toxic or medicinal species. Among the species that occur in this area and resemble hairy eupatorium are white snakeroot (Eupatorium rugosum Houtt.) and boneset (E. perfoliatum L.). The former contains a poisonous substance known as trematol, which causes milk sickness or trembles. The latter is the source of a drug called eupatorium or boneset.

Description

A coarse, straight-stemmed, tall perennial having one to several stems growing from a rootstock (fig. 53, a and b).

The leaves grow in pairs on opposite sides of the stem. They are nearly sessile. The blades are mostly 1 to 3 inches long, coarse-veined, unevenly tooth-edged, and very hairy. Very short side branches or "suckers" usually grow from the axils of the stem leaves (fig. 53c).

The stems grow 2 to 3 feet tall. Several branches appear in pairs on opposite sides of the upper stem. Each branch produces a flat-topped flower cluster (fig. 53a). The clusters subdivide into groups of very small flower heads, 1/4 inch high or less. The heads are white and gray-green and have 5 to 8 tubular disk flowers (fig. 53, d and e). The heavy cover of microscopic grey-white hairs makes the bracts of the involucre look gray-green.

The achene has a crown of long silky hairs that makes it easy for the wind to scatter the seed.

Seasonal aspects

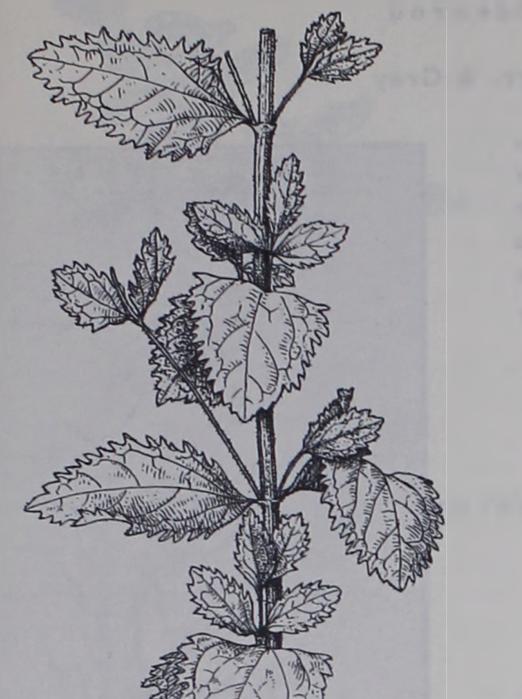
Hairy eupatorium sends up a straight leafy stem in spring. The plant branches and flowers in June and July, matures its seeds in late summer, and dries up in fall.

Dogfennel

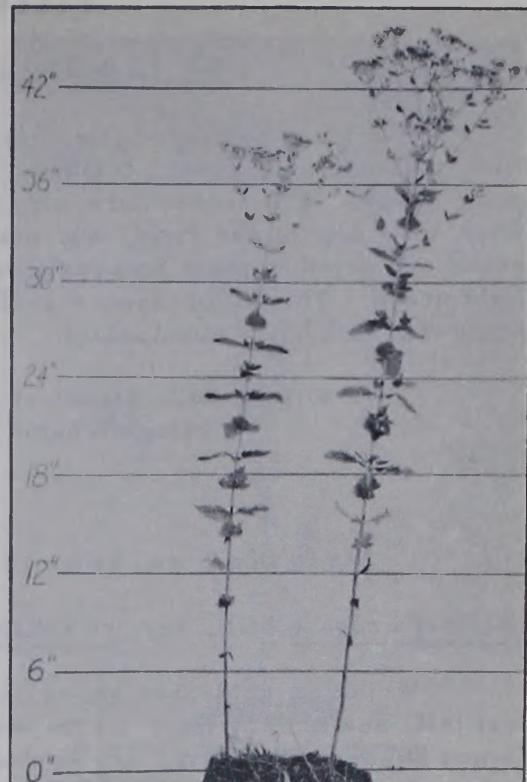
Eupatorium capillifolium (Lam.) Small

Dogfennel, also called false cedar, is a large, persistent, very fine-leaved weed that grows around farmsteads, barns, heavily-grazed pastures, and abandoned fields. Southerners call it Yankeeweed. It looks somewhat like a small cedar tree at a distance, and not like the other eupatoriums.

Dogfennel produces many seeds. After getting a start, it produces large rootstocks that are hard to dig up. Unless destroyed, the plant spreads by adding new rootstocks each year, and soon forms a large clump.



c. Middle of stem (1/2x)



a. Growth habit in July



b. Lower stem (1/2x)



d. Young flower head (6x)

e. Mature flower head (6x)

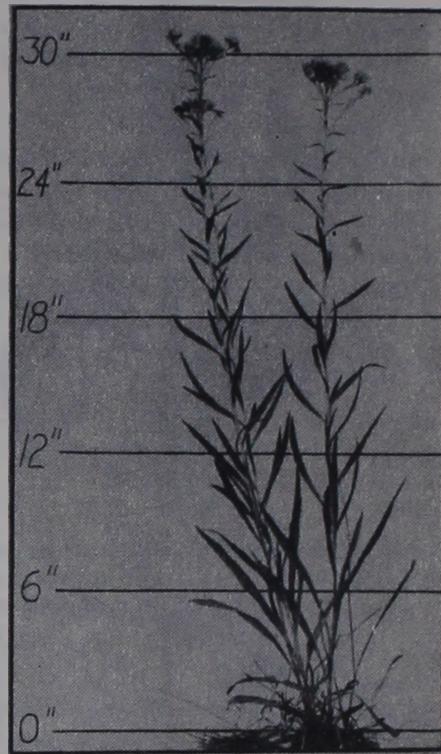
FIGURE 53.—HAIRY EUPATORIUM.

Blackleaf goldenrod

Solidago nitida Torr. & Gray

Blackleaf goldenrod (fig. 54) has grass-like, pointed, pale green, leathery leaves that point upward. The leaves turn very dark brown when they dry in the field, but when picked green and dried in plant presses they cure to a light green. The inflorescence is flat-topped, somewhat like hairy eupatorium.

Figure 54. --Blackleaf goldenrod:
Growth habit in August.



Wrinkled goldenrod

Solidago rugosa Mill. var. celtidifolia Small

Wrinkled goldenrod grows from 2 to 7 feet tall and is very leafy all the way up to the flower heads. The leaves are similar to eupatorium leaves--they are 1 inch long, $7/8$ inch wide, and have so many coarse veins that they look wrinkled. The racemes are similar to those of fragrant goldenrod--one-sided and curved.

Fragrant goldenrod

Solidago odora Ait.

Fragrant goldenrod (fig. 55) grows throughout the cut-over pinelands. It is very conspicuous and colorful in fall. The crushed leaves have a spicy, fragrant odor, somewhat like anise. It is not grazed much by cattle, but deer browse the golden flower racemes in summer.

Description

A perennial that grows from a large rootstock and often has only one stem. The leaves are smooth, slender, and pointed and about 1 to 4 inches long and $1/8$ to $1/2$ inch wide. They usually incline downward (fig. 55, a and c).

The stems are smooth, upright, slender, and often curved near the top. They grow 1-1/2 to 4 feet tall and are red or yellow-red. The stem branches near the top to form several curved, one-sided racemes, each bearing about a dozen small golden-yellow flower heads (fig. 55, d and e). The heads are made up of 2 to 4 yellow ray flowers and 3 to 5 disk flowers (fig. 55, f and g). Both kinds of flowers have a pap-pus, which aids in the dissemination of the achene.

Fragrant goldenrod becomes conspicuous and colorful when the flowers open in fall. It is dormant in winter, and makes slow growth in early spring.

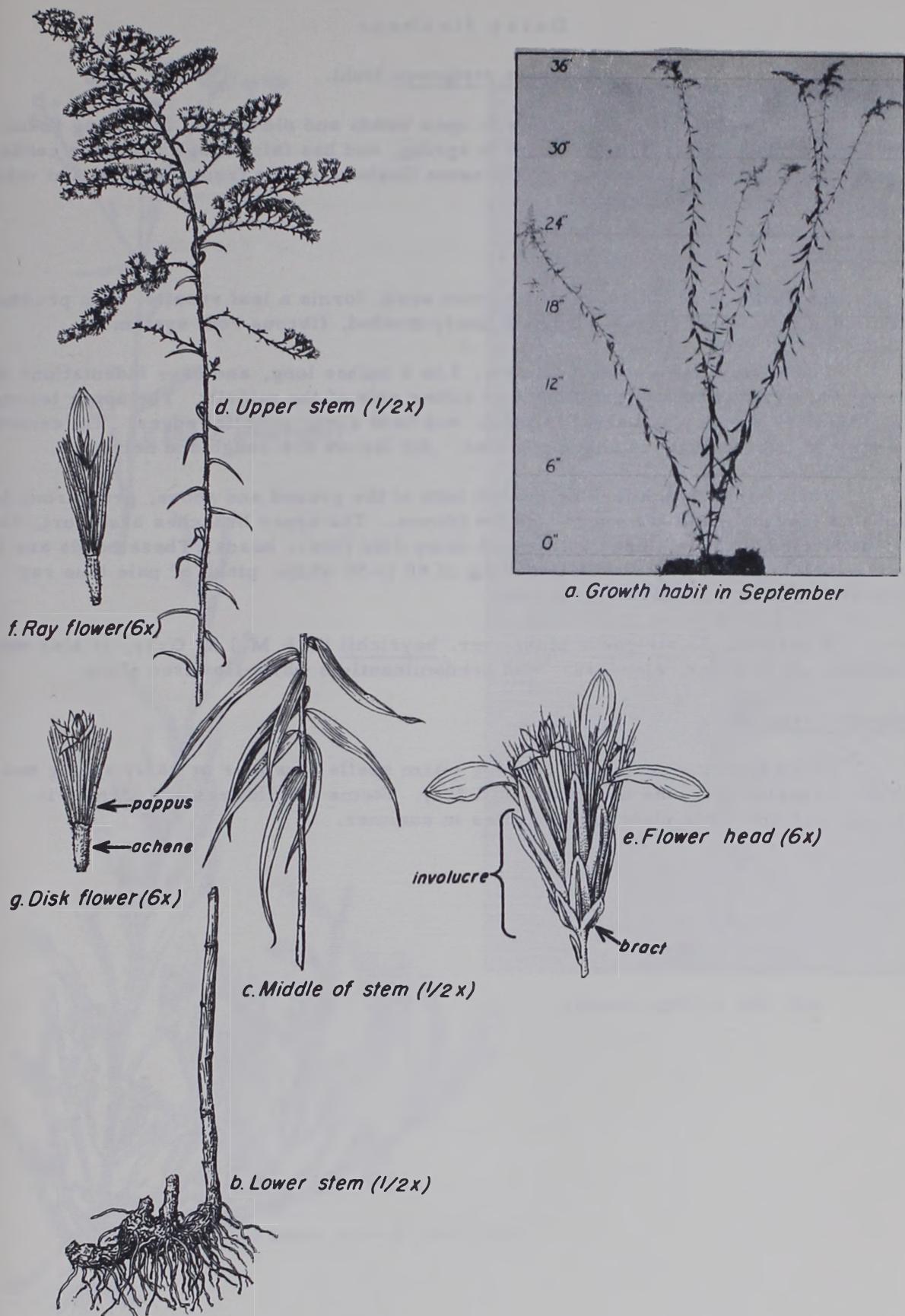


FIGURE 55.—FRAGRANT GOLDENROD.

Daisy fleabane

Erigeron strigosus Muhl.

Daisy fleabane (fig. 56) grows in open woods and old fields, and along roads and trails. It is moderately abundant in spring, and has fair forage value for cattle. It is browsed by deer in summer. The name fleabane stems from the supposed value of some species as flea repellents.

Description

An annual that starts in winter from seed, forms a leaf rosette, then produces stems and flowers in spring. It has a finely divided, fibrous root system.

The rosette leaves are spatulate, 3 to 6 inches long, and have indentations on the edges. Two veins are prominent on either side of the midrib. The upper leaves (fig. 56c) are slender and short (1 inch), and have even, parallel edges. The central leaves are intermediate in shape and size. All leaves are rough and hairy.

The stems, which fork or branch both at the ground and above, grow from 2/3 foot to 3 feet tall, and are rough like the leaves. The upper branches are short, slender peduncles that are tipped with small daisy-like flower heads. These heads are 1/4 to 1/2 inch broad and have a distinct ring of 40 to 50 white, pink, or pale blue ray flowers. The disk flowers are yellow.

A variety, E. strigosus Muhl. var. beyrichii (F. & M.) A. Gray, is also very common. It is taller, slenderer, and predominantly a white-flowered plant.

Seasonal aspects

Daisy fleabane germinates during warm spells of winter or early spring and forms a rosette of leaves that lasts until May. Stems and flowers are formed in spring, and the whole plant disintegrates in summer.

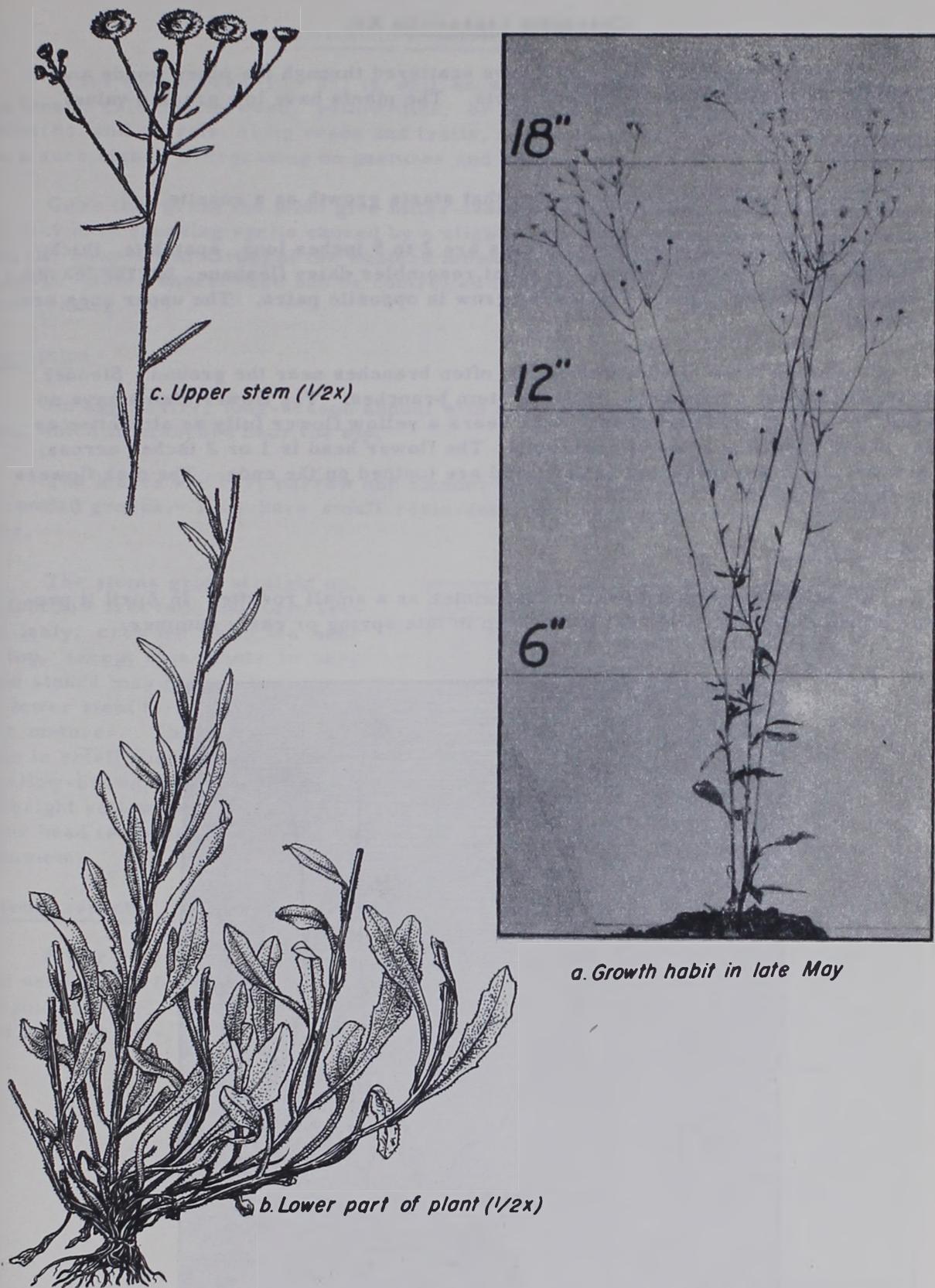


FIGURE 56.—DAISY FLEABANE

Thickleaf coreopsis

Coreopsis crassifolia Ait.

Thickleaf coreopsis (fig. 57) grows scattered through the piney woods and in old fields, especially on well-drained spots. The plants have low grazing value.

Description

A small, short-season perennial that starts growth as a rosette.

The rosette and other lower leaves are 2 to 5 inches long, spatulate, thick, and rough-hairy. In early spring the plant resembles daisy fleabane, but the leaves do not have indented edges. The leaves grow in opposite pairs. The upper ones are very small.

The main stem is very short, and often branches near the ground. Slender unbranched flower stems grow from the stem branches. The flower stems have no leaves, or only a few short ones. Each bears a yellow flower fully as attractive as many of the garden species of coreopsis. The flower head is 1 or 2 inches across. The ray flowers are large and yellow, and are toothed on the ends. The disk flowers are reddish-brown.

Seasonal aspects

Thickleaf coreopsis starts in late winter as a small rosette. In April it produces stems and flower stalks. It dries up in late spring or early summer.

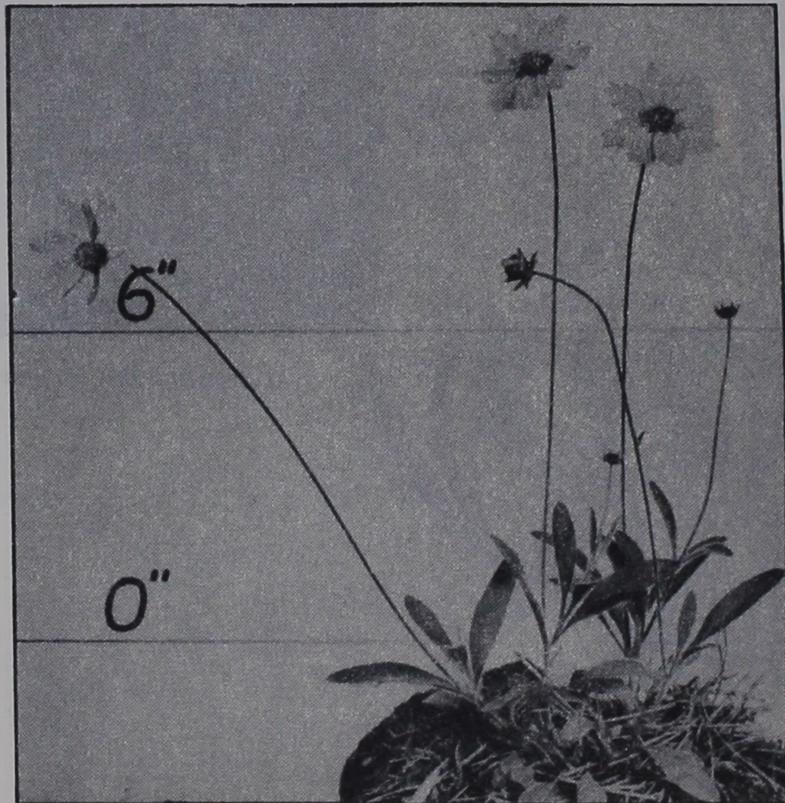


Figure 57. -- Thickleaf coreopsis:
Growth habit in April.

Bitter sneezeweed

Helenium tenuifolium Nutt.

Bitter sneezeweed (fig. 58) is well known to farmers throughout the South. It is locally called bitterweed, yellow-dick, or Spanish daisy. It grows in pastures, barnyards, and corrals, along roads and trails, and on most other heavily used places. It is a sure sign of overgrazing on pastures and ranges.

Cows that graze the plant give bitter-tasting milk. Animals that eat too much of it may have sneezing spells caused by a slightly poisonous drug. The orange sneezeweed (H. hoopesii A. Gray) of the western mountain ranges often causes heavy losses in sheep. Bitter sneezeweed can be controlled in pastures by repeated mowing and reduced grazing.

Description

An aggressive, long-season annual with a fibrous root system. It has a single stem, which is branched near the top.

The leaves are very narrow and slender (1/2 inch to 2 inches long) and grow in crowded groups. They have small resin-dots, and their juice is very acrid and bitter.

The stems grow straight up, 1/2 foot to 3 feet tall, and form several leafy, crowded branches near the top, except that plants in very dense stands may have no branches. The lower stem turns purple as the plant matures. The flowers are borne in small round heads made up of yellow-brown disk flowers and 6 to 8 bright yellow ray flowers. The flower head is about 1/2 to 3/4 inch in diameter.

Seasonal aspects

Bitter sneezeweed starts from seed in spring and blooms about midsummer. It flowers until frost and then dies.

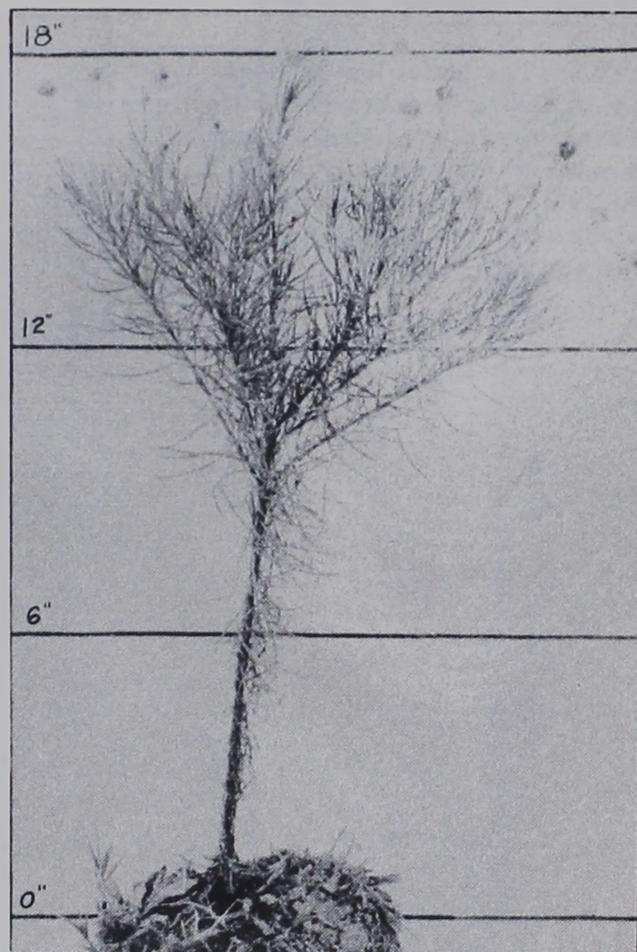


Figure 58. --Bitter sneezeweed:
Growth habit in July.

Plantainleaf coneflower

Rudbeckia alismifolia Torr. & Gray

Plantainleaf coneflower (fig. 59) grows on both wet and dry sites throughout the piney woods. The plants are scattered. Cattle sometimes graze the leaves in spring. Deer eat the young leaves and stems during spring and summer, and quail and doves feed on the seed.

Description

A coarse perennial with large, thick rootstocks.

The early, basal leaves grow on long petioles in conspicuous clusters and resemble waterplantain leaves. Blade and petiole together measure 6 to 15 inches long. The blades themselves are paddle-shaped, 2 inches wide and 4 inches long. The stem leaves are smaller.

The stems are very slender, 2-1/2 to 5 feet tall, square with distinct ribs, unbranched, and topped by a conspicuous, solitary flower head. The flower head is round, slightly cone-shaped, and 3/4 inch across. The numerous small, crowded disk flowers are brownish-purple and the 10 to 15 ray flowers are light yellow. The ray flowers are large and drooping, 1/2 inch wide by 1 inch or more in length.

Seasonal aspects

The basal leaves develop in spring in a loose rosette. Flowers are produced in mid-summer. The plant dries up in early fall, but old stems with black heads persist through winter and into spring.

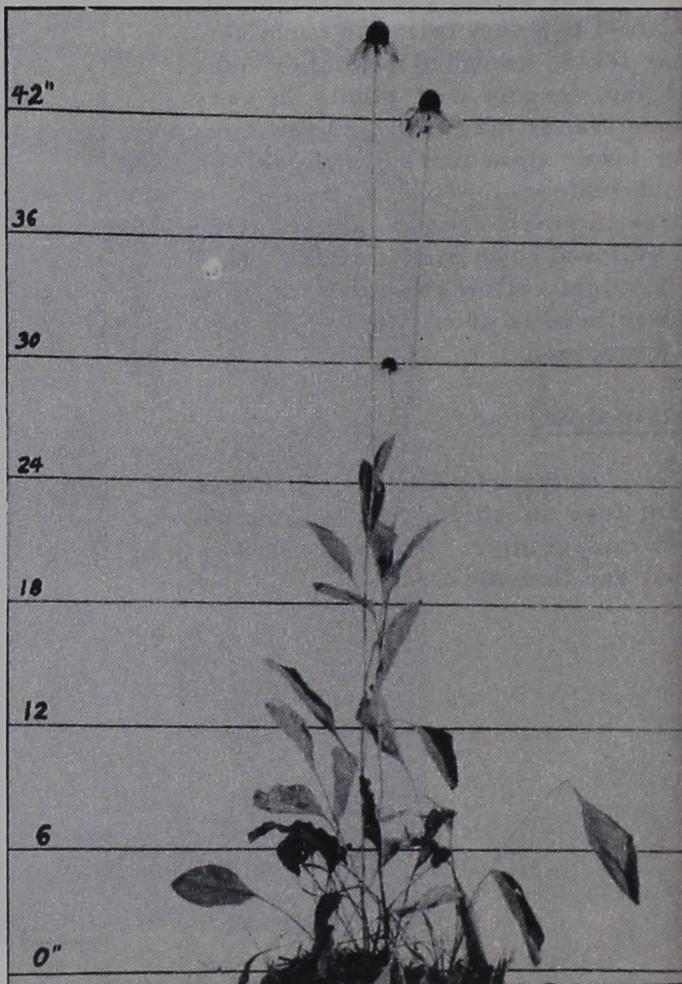


Figure 59. --Plantainleaf coneflower: Growth habit in July.

Pinkscale gayfeather

Liatris elegans (Walt.) Willd.

Pinkscale gayfeather (fig. 60) is moderately abundant in dry woodlands but is poor forage. Deer browse it in spring and summer.

The plant is an attractive, slender, unbranched perennial that grows from a round tuberous rootstock. The leaves are narrow, slender, resin-dotted, and pointed; they range from 1/2 inch long on the upper part of the stem to 4 or 5 inches near the ground. The upper leaves point downward. The stem is unbranched, erect, 1 to 3 feet tall, and produces numerous small flower heads in a spike-like raceme. The inner hairy bracts of the involucre are prolonged into pink membranous tips. The purple-green raceme is 4 to 6 inches long and about 1 inch across. The small heads have just a few flowers. The flowering period is late summer and fall.

Kansas gayfeather

Liatris pycnostachya Michx.

Kansas gayfeather (fig. 61) grows in sandy, fairly well-drained soils. It is moderately numerous and very showy on some areas. Cattle seldom use it, but deer browse it in spring and summer.

It is a large perennial having tuber-like rootstocks with a fibrous cover. The leaves, which are prominent throughout the length of the stem, are slender and dark green. The upper leaves are short and point skyward; the long, lower leaves bend over.

Several stems are produced by each plant; they are erect, 2 to 5 feet tall, unbranched, and covered with leaves and numerous white hairs. The purple flower spike blooms in mid-summer and early fall. It is 1/2 foot to 1-1/2 feet long and is thickest near the top. Each spike is made up of very small (1/4 inch long) heads of several purple-tipped flowers that are surrounded by purple, petal-like involucral bracts with tips that curve downward.

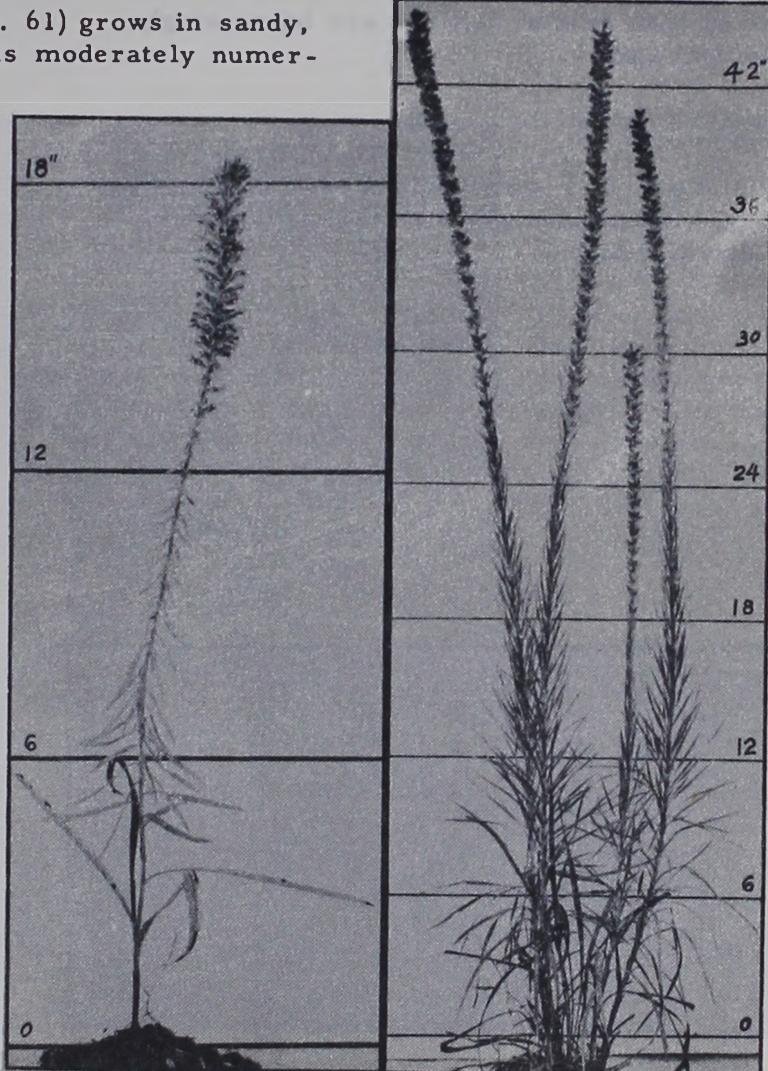


Figure 60. --Pinkscale
gayfeather.

Figure 61. --Kansas
gayfeather.

OTHER FORBS

Poor Joe

Diodia teres Walt.

Poor Joe (fig. 62), sometimes called rough buttonweed, is very common in disturbed areas, roads, trails, open woods, and open grassland. It is a member of the madder family (Rubiaceae), a large group, mostly tropical, of which the coffee tree is the most valuable. Poor Joe is lightly grazed, but its total forage value is low. Quail eat the seeds when other foods are scarce.

Description

A small annual with a slender stem that branches and spreads when the plant is not crowded. The stems range from 5 to 16 inches long. The leaves, which grow in opposite pairs, are slender, pointed, sessile, and about $1/2$ inch to $1-1/2$ inches long. Leaf stipules have long bristles extending beyond the fruit. Small white or pink tubular flowers are borne singly in the leaf axils.

Seasonal aspects

Poor Joe germinates from seed in spring, blooms throughout spring and summer, and dries up in fall.

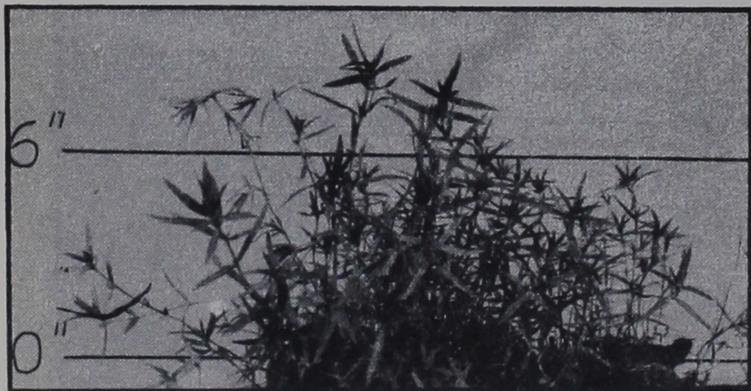


Figure 62. —Poor Joe.
Left: Growth habit. Right: Upper stem.

Woolly croton

Croton capitatus Michx.

Woolly croton, locally called goatweed (fig. 63), grows in heavily used areas--especially along roadsides and in corrals, old fields, and heavily grazed pastures. It is an indicator of overgrazing and trampling. It is not grazed by cattle, but upland birds feed on the seeds almost exclusively when they are available.

The plant contains croton oil, a toxic substance that acts as a powerful cathartic. It is a member of the spurge family (Euphorbiaceae).

Description

A coarse annual that is covered with silvery or gray-brown hairs that are in very tiny star-shaped clusters. The leaves have long petioles. The base of the blade is rounded and the tip is pointed. The stems, which grow from 1/2 foot to 5 feet tall, are erect and usually branched near the top. The flowers are inconspicuous, being borne in grayish-purple hairy clusters at the tip of the stem or branches.

A similar species, Engelmann croton (Croton engelmannii Ferguson), is distinguishable from woolly croton by its shorter leaf petioles and gray-yellow flowers.

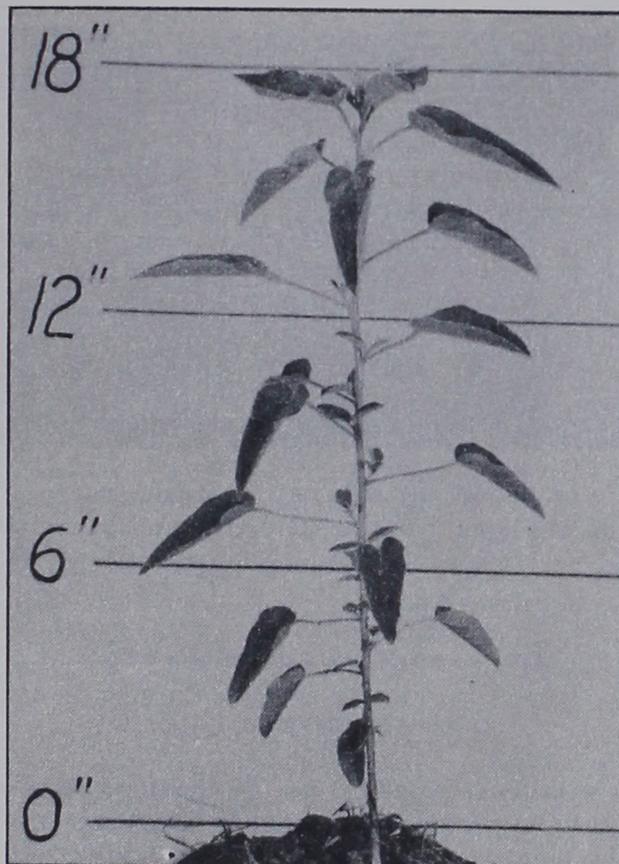


Figure 63. --Woolly croton: Growth habit in July.

Queensdelight stillingia

Stillingia sylvatica L.

Queensdelight stillingia (fig. 64), sometimes called queens-root, grows on deep sandy loam soils in the pineywoods uplands. It is not grazed by cattle. A member of the spurge family, it is used medicinally, the root being the source of a drug called stillingia.

Description

A smooth upright perennial. The leaves are alternate, $1/2$ inch to 4 inches long and $3/8$ to 1 inch wide. They are sessile, rounded at the base, and pointed at the tip. The margins usually have small, dark, incurved gland-tipped teeth. When crushed or broken, the leaves and stem emit the white milky juice typical of most spurge.

The stem is 1 to 4 feet tall, erect, and branched from the base. The inflorescence at the top of the stem is a stout fleshy spike 1 to 4 inches long. The flowers have no petals, but occur in the axils of small yellowish bractlets which have a large saucer-shaped gland on either side. The male flowers are in the upper and the female flowers are in the lower part of the spike. The fruit is a capsule about $1/2$ inch broad and with 3 deep lobes. Each lobe produces seeds.

The plant blooms in May and June and matures in late summer. It is recognizable by the old stalks through the winter.



Figure 64. --Queensdelight stillingia.
Left: Top of plant. Right: Growth habit in summer.

Maryland meadowbeauty

Rhexia mariana L.

Maryland meadowbeauty (fig. 65) grows in openings on poorly-drained sites both in the uplands and the flatwoods. Deer crop it heavily in spring, but cattle usually do not graze it. The plant is a medium-sized perennial with slender rootstocks. The leaves grow in opposite pairs. They are 1 inch to 2 inches long, narrow, and tapered at both ends. The stem grows from 1 foot to 2-1/2 feet tall, is slender, and branches about halfway up. The flowers are purple, showy, about 1 inch wide, and have four rounded, conspicuous petals. The fruit is urn-shaped—rounded at the bottom, narrow-necked, and flared out at the top. The plant blooms in spring and early summer.

Slender mountainmint

Pycnanthemum flexuosum (Walt.) B. S. P.

Slender mountainmint (fig. 66) grows in cut-over pinelands, oak thickets, and meadows. It is a member of the mint family (Labiatae), and as such is characterized by square stems and opposite leaves. When crushed it gives off a pleasant mint odor. It usually is not grazed.

Description

Grows in irregular clumps or colonies that arise from rootstocks. Its leaves are small, slender, $1/8$ inch wide by $1/2$ inch to $1-1/2$ inches long, and often crowded on short branches. The stems, which usually grow in bunches of a dozen or more, are woody, slender, and either upright or spreading. They grow 1 to 3 feet tall. Flowers are produced on the upper stem branches in flat-topped clusters composed of many small white flower heads. Each head is about $1/4$ inch wide and is made up of several very small individual flowers.

Slender mountainmint is inconspicuous in spring. The flower clusters form in summer and turn purple-gray in fall. The plant is comparatively hardy, dies slowly in winter, and persists like a half-shrub.

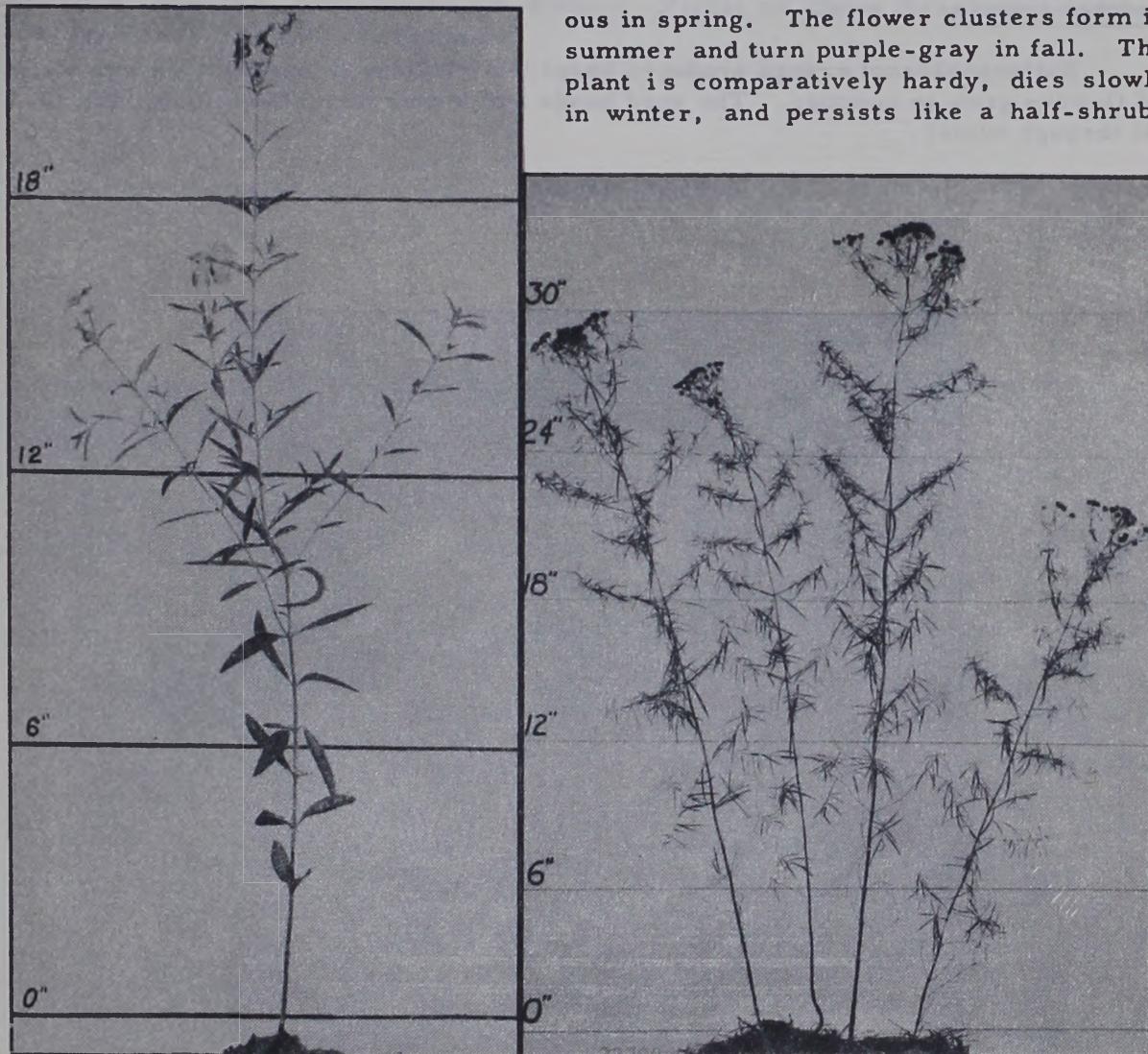


Figure 65. --Maryland meadowbeauty:
Growth habit in July.

Figure 66. --Slender mountainmint:
Growth habit in July.

Buttonsnakeroot eryngo

Eryngium aquaticum L.

Buttonsnakeroot eryngo (fig. 67) grows on a variety of sites from crawfish flats to sandy, well-drained uplands. The plants are scattered and grazed only in early spring. The eryngos belong to the carrot family (Umbelliferae), which contains several valuable forage plants, some very poisonous plants, and some drug-producing plants. Buttonsnakeroot eryngo is a source of the drug, eryngium.

Description

A perennial with leaves that are long, slender, pointed, parallel-veined, glossy, almost fleshy, and have spines along the edges.

The leaves are alternate, mostly in basal clusters. A few shorter leaves grow on the flower stems, which are slender, slightly zigzag, and 1 to 6 feet tall. Flowers are borne on stout peduncles near the top of the stem. The flower heads are light gray, bristly, and ball-like—1/2 to 1 inch across.

Seasonal aspects

Buttonsnakeroot eryngo produces basal leaf clusters in spring. Flower stalks and flowers grow in summer. The seed heads and leaves turn brown in fall and persist through winter.

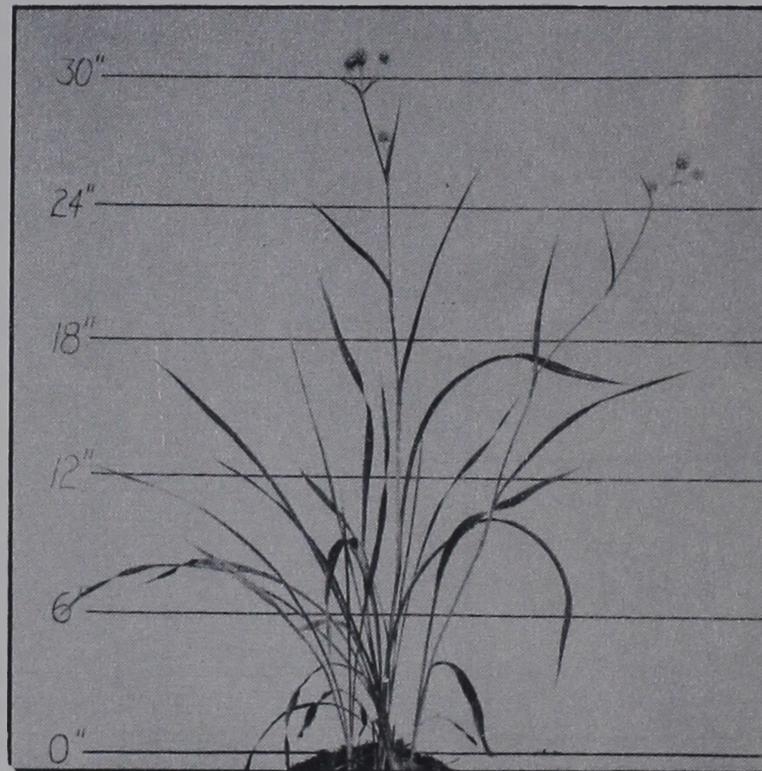


Figure 67. — Buttonsnakeroot eryngo:
Growth habit in July.

Southern bracken

Pteridium aquilinum (L.) Kuhn var. *pseudocaudatum* (Clute) Heller

Southern bracken (fig. 68) is a coarse fern that usually grows on moist, heavily wooded sites, particularly on slopes where sunlight seldom penetrates. It is generally associated with creeks and deep woods rather than open grassy forests. Cattle graze it in early spring, but it is not abundant and is considered poor forage. It is suspected of being slightly poisonous if eaten in large amounts.

Ferns are not flowering plants and do not produce seed. They multiply by rootstocks and by microscopic spores that develop in dark spore cases just under the leaf edges. They have no stems, and the above-ground parts that resemble leaves are correctly called fronds.

Description

Southern bracken is a perennial that shoots up early in spring from rootstocks. The fronds are dull green, 1 to 5 feet long, and 1 to 3 feet wide. They are double-pinnately compound, being finely sub-divided. Figure 68 shows three compound fronds with their foot-long petioles (stipes).

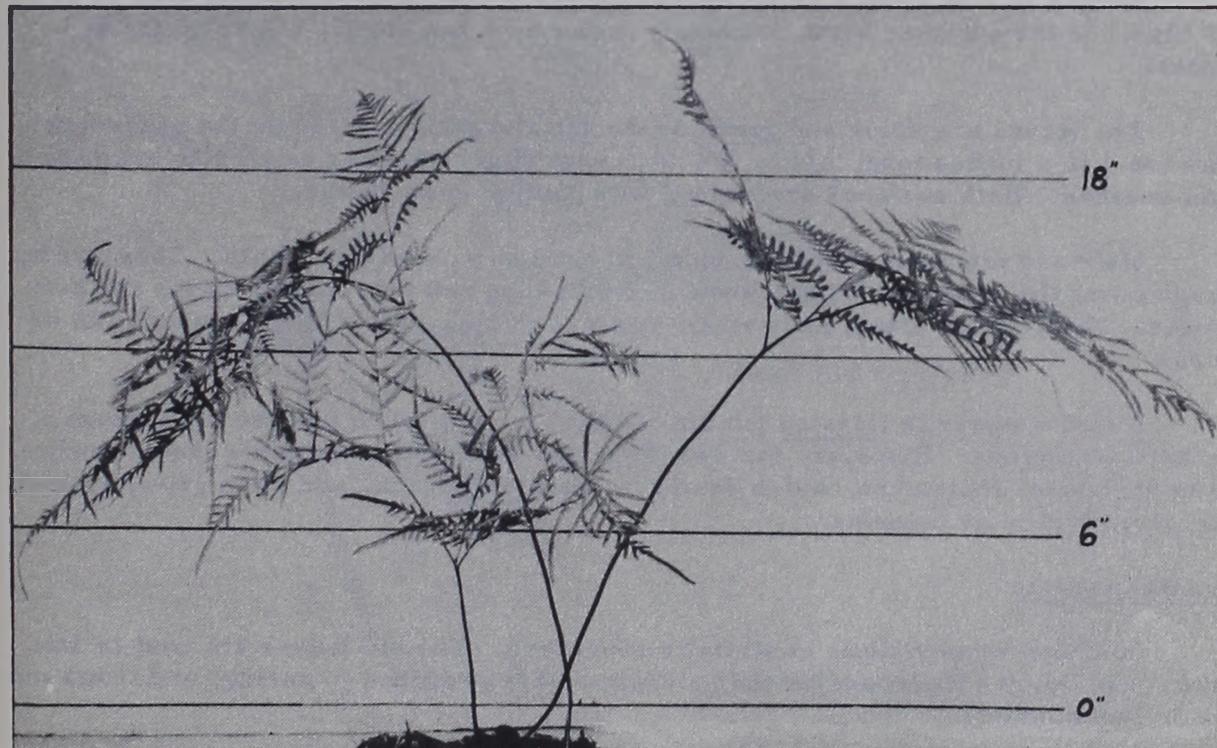


Figure 68. --Southern bracken: Growth habit in July.

SHRUBS AND WOODY VINES

Shrubs make up between 1 and 5 percent of the ground cover on most ranges in the cut-over longleaf pine lands. There are thickets and creek-bottom types where shrubs dominate the undergrowth vegetation, but these types form a minor part of the area. On a range in central Louisiana, shrubs made up about 2 percent of the average yearlong cattle diet. Essentially all browsing (shrub grazing) was in December to March, when there was little green grass. Shrubs will be even less important in the cattle diet if these ranges are used during the optimum grazing period--spring, summer, and early fall. Shrubs are more abundant and have much higher grazing value in the loblolly pine-hardwood and bottomland hardwood forests than in the longleaf pine area.

Southern waxmyrtleMyrica cerifera L.

Southern waxmyrtle (fig. 69) is probably the most abundant and characteristic shrub in the cut-over pinelands of Louisiana and east Texas. It is widely distributed in both uplands and flatwoods. The plants, which are grazed in January and February, sometimes make up 5 to 10 percent of the cattle diet during the colder spells. The leaves are relatively high in protein during winter. Quail use waxmyrtle patches for cover, and eat the fruit when other food is scarce. Early settlers boiled the leaves and fruit to secure wax for bayberry candles. Home owners in central Louisiana use waxmyrtle for landscape plantings.

Description

Ranges in size from a small spreading shrub (fig. 69a) to a small tree 30 or 40 feet high. In the cut-over area, it usually grows as a low shrub, either singly or in thickets.

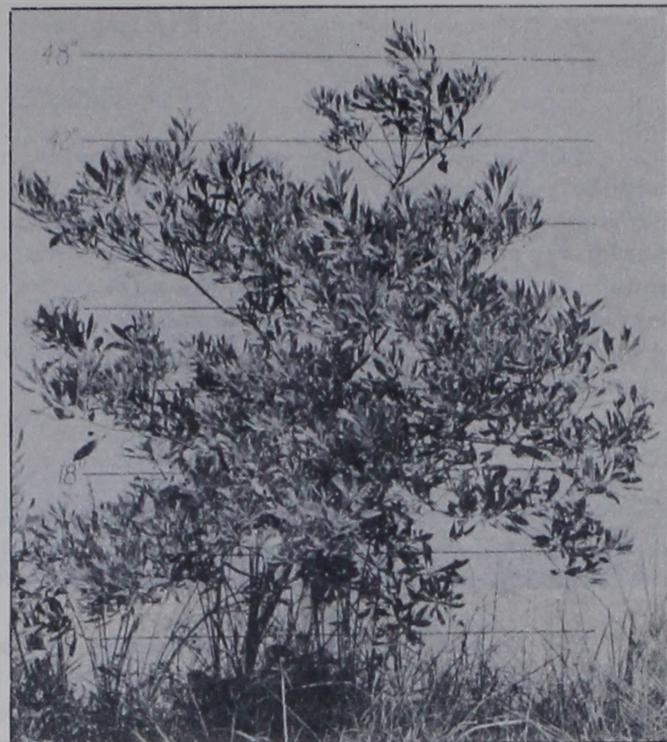
The leaves are shiny and green on the top and yellow-green on the under side. They are 1 to 4 inches long, 1/4 to 3/4 inch wide (fig. 69b), and smell like camphor when crushed. Both surfaces are dotted with yellow resin glands.

Male and female flowers are borne in catkins on separate plants. They are inconspicuous; the male catkins are about 1/2 inch long and the female catkins are even shorter. The fruiting plants have small clusters of blue-gray, round, waxy fruits or drupes.

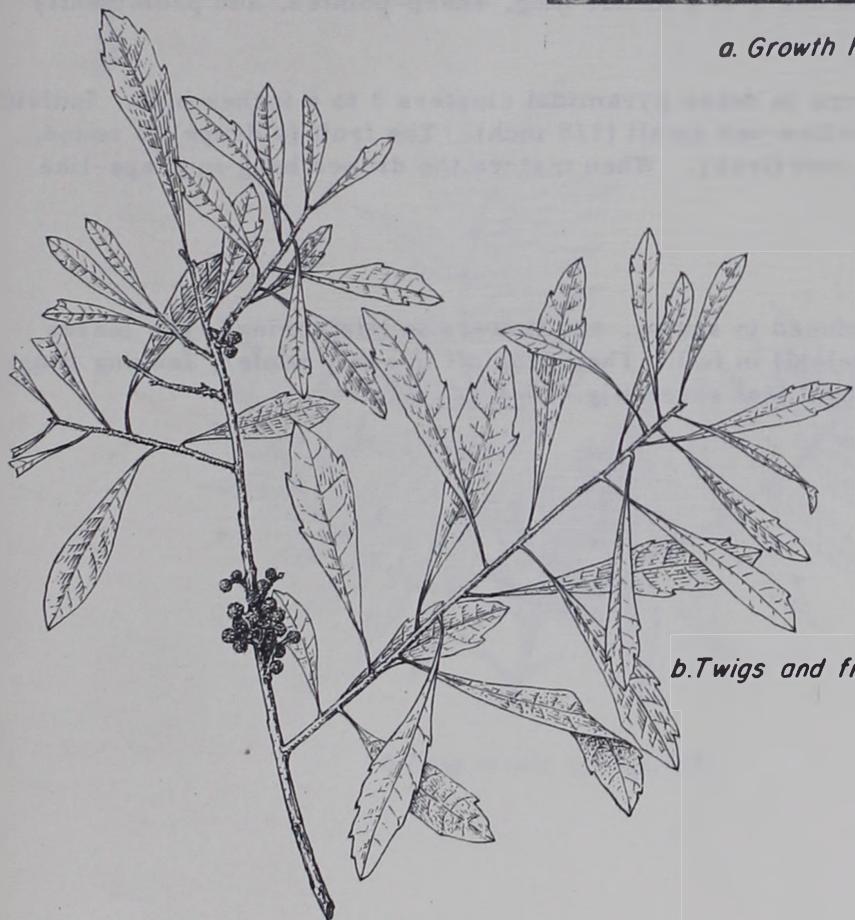
Dwarf waxmyrtle (Myrica pumila Michx.) is very much like the shrub form of southern waxmyrtle. However, the dwarf species seldom grows higher than 30 inches. It has horizontal rootstocks, which southern waxmyrtle lacks, and often grows in thick, extensive patches or colonies.

Seasonal aspects

Southern waxmyrtle is essentially evergreen. The old leaves are cast in late winter just before new leaves develop. Flowers are produced in spring, and fruits mature in late summer.



a. Growth habit in July



b. Twigs and fruit (1/2x)

FIGURE 69.—SOUTHERN WAXMYRTLE.

Shining sumac

Rhus copallina L.

Shining sumac, also known as flameleaf sumac (fig. 70), is fairly common on reasonably dry or well-drained sites in the piney woods. It is particularly characteristic of mounds, knolls, and ridges. It grows more in wooded areas than in open grasslands; possibly frequent burning has reduced it in the open. Shining sumac is not poisonous, although it belongs to the cashew family (Anacardiaceae), which contains the poison-tree genus (Metopium) and is closely related to poison-sumac, poison-oak, and poison-ivy. Cattle graze the twigs of shining sumac in winter. The fruit is eaten by quail and other upland birds.

Description

A rough, sparingly branched, crooked-stemmed shrub (fig. 70a) or tree that usually grows 2 to 8 feet high but may become taller under favorable conditions. It sometimes spreads from suckers to form thickets.

The leaves are 6 to 10 inches long, and odd-pinnately compound with one terminal leaflet and 4 to 10 pairs of lateral leaflets. The leaf stem or rachis is distinctly winged between each pair of leaflets. These wings identify the species as non-poisonous (fig. 70b). The leaflets are 1 to 4 inches long, sharp-pointed, and prominently veined.

The flowers are borne in dense pyramidal clusters 3 to 6 inches high. Individual flowers are greenish-yellow and small (1/8 inch). The fruit (a drupe) is round, 1/8 inch in diameter, red, and fleshy. When mature, the drupes hang in grape-like clusters.

Seasonal aspects

New leaves are produced in spring, and flowers in late spring. The leaves turn brilliant scarlet (flameleaf) in fall. They drop off in early winter, leaving rough, dull-gray twigs with prominent leaf scars (fig. 70c).



c. Twig in winter ($1/2x$)



a. Growth habit in October



b. Twig in late spring ($1/4x$)

FIGURE 70.—SHINING SUMAC.

Elliott blueberry

Vaccinium elliottii Chapm.

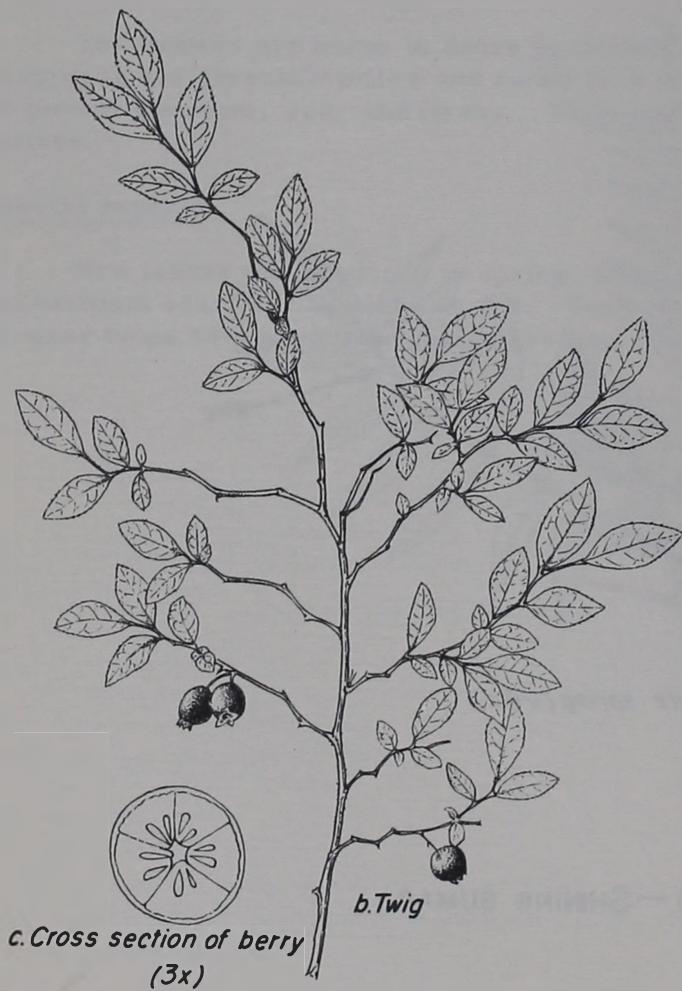
Elliott blueberry (fig. 71), often referred to as huckleberry, grows mainly in forested areas, being rarely found in open grasslands. It is an important browse plant for deer, particularly in spring. The berries make good pies and are also eaten by deer and other wildlife. Cattle browse Elliott blueberry heavily in winter, and the species probably has been reduced in abundance by overgrazing.

Description

A medium-sized, finely-branched shrub. The leaves (fig. 71b) are small (3/4 inch long by 1/2 inch wide), oval, yellow-green, and have tiny saw-edges. The main stem often branches near the ground, and the several side branches grow erect. The bark is reddish-green and remains so during winter. The small flowers are bell-shaped and pink. They grow in clusters, and hang upside down as they develop. The fruit is blue-black, round, 5/16 inch in diameter, and juicy (fig. 71c).

Seasonal aspects

Elliott blueberry blooms in early spring, before it produces leaves. It matures berries in May or June and loses its leaves in fall. The twigs remain reddish-green in winter.



a. Growth habit in June

FIGURE 71.—ELLIOTT BLUEBERRY.

St. Andrewscross

Ascyrum hypericoides L.

St. Andrewscross (fig. 72) grows best on moist sandy soils but is found in wooded areas throughout the longleaf pine region. It is scattered and is grazed very little.

The plant is a small, leafy, much-branched, woody shrub that usually grows in irregular clumps 2 to 3 feet high. The leaves are sessile, slender, and from $1/4$ to $1/2$ inch long. They grow in opposite pairs, often with smaller leaves crowded in the axils.

The stems are small and woody, branch in opposite pairs, and have reddish-brown bark that shreds off in strips as it dries. Many small, single flowers are produced in early summer. They are $1/2$ to $3/4$ inch broad and bright yellow, and have 4 sepals and 4 petals that spread out to form a cross. Two of the sepals are very small; the other two are conspicuous. The sepals later surround the fruit (capsule), giving it a winged appearance.



Figure 72. --St. Andrewscross: Growth habit in July.

Common persimmon

Diospyros virginiana L.

Common persimmon (fig. 73) grows along drainages and roads, and in old fields and woods. It is a nuisance in cultivated pastures because it persistently resprouts after being cut off. It has no grazing value, but the yellow, plum-shaped fruit is edible. The very heavy, hard, and strong wood is prized for special purposes, such as golf club heads and shuttles.

Description

Usually a small tree with a rounded crown, but on good sites may grow to 60 feet tall.

The bark on older trees breaks up into distinctive, square, scaly blocks. The leaves are oval, large (4 inches long by 2 inches wide), and dark green on top and light green underneath.

The flowers are small. Male and female flowers are borne separately. Some trees bear no female flowers, hence no fruit. The fruit is a round, orange berry about 1-1/4 inches across; it contains 4 to 8 large flat seeds. Persimmon blooms inconspicuously in spring, matures fruit in fall, and loses its leaves after the first frost.

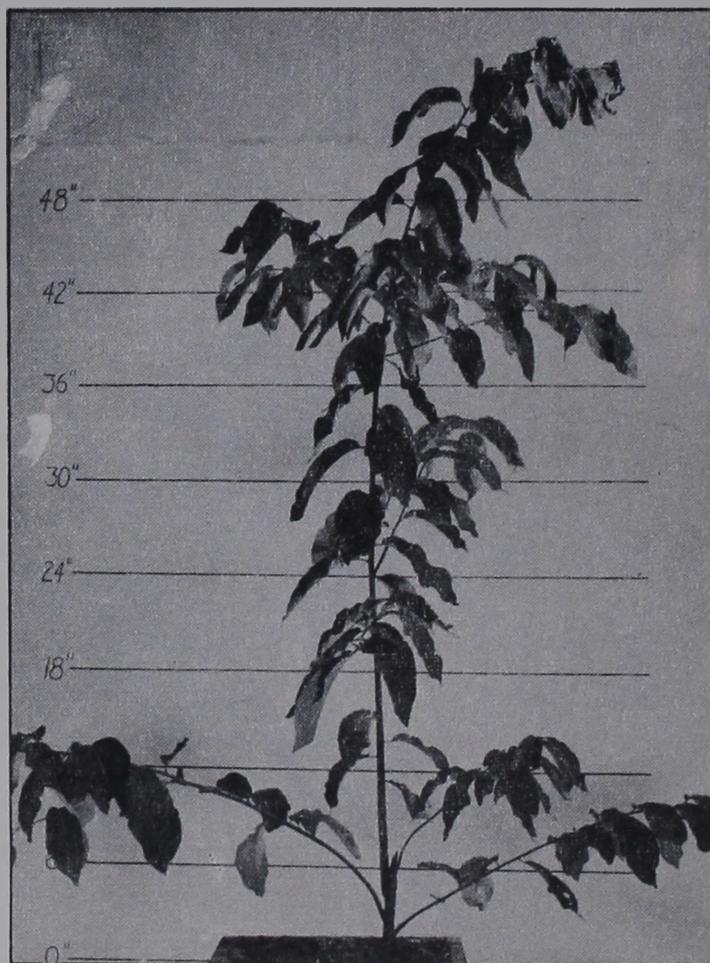


Figure 73. --Common persimmon:
Growth habit of young sprout.

Alabama supplejack

Berchemia scandens (Hill) Trelease

Alabama supplejack (fig. 74), also called rattan vine, grows in flatwoods and other wet areas, and particularly on loblolly pine sites. It is a stout woody vine that twists around and strangles pine trees, killing them or greatly reducing the quality of the logs. Supplejack damage is often noticeable in loblolly pine plantations that have been protected from fire for many years. Deer browse the plant and squirrels eat the fruit.

The leaves are oval, 1 to 4 inches long, about 3/4 inch wide, and have 9 to 12 pairs of prominent, evenly spaced, parallel veins.

The flowers are inconspicuous. The fruit is a black drupe--a 2-seeded bony nut with a thin fleshy cover that is about 1/2 inch long and grows in small clusters. The leaves, flowers, and fruit are often high in trees. The upper stem develops many fine, supple branches.



Figure 74. --Alabama supplejack.

Yellow jessamine

Gelsemium sempervirens (L.) Ait.

Yellow jessamine (fig. 75), also commonly called Carolina jessamine, usually grows in wet, wooded areas. The leaves, flowers, and twigs are poisonous to cattle, sheep, goats, and horses, which sometimes browse the plant when other forage is scarce. Deer have been observed to eat the leaves, apparently without ill effect.

An evergreen, twining, much-branched woody vine. The stems and branches are often tangled. The branches are reddish-brown. The leaves are in opposite pairs, lance-shaped, evergreen, and shiny. They are usually 1 to 2 inches long and 1/2 to 3/4 inch wide.

The plant blooms in late winter and early spring. The flowers are very showy, deep-yellow, and fragrant. They are about 1-1/2 inches long and are composed mainly of a funnel-shaped yellow tube with 5 lobes at the top.

Poison-oak

Toxicodendron quercifolium (Michx.) Greene (=Rhus toxicodendron L.)

Poison-oak (fig. 76) is widely distributed on sandy soils. Though it grows in open areas, it is most abundant in the woods. Poison-oak and poison-ivy are closely related, and some authorities regard them as two ecological forms of the same species. Both plants contain a sticky resinous substance that is an allergic skin poison. In winter, when preferred foods are scarce, quail eat poison-oak fruits in quantity.

The plant is a small, erect half-shrub that spreads by underground stems. The stem is often unbranched and 1 foot to 2 feet tall. It never climbs. Each leaf is composed of three leaflets that are leathery and lobed like some oak leaves. In comparison with poison-ivy, the leaves are blunt-pointed or rounded. Small, greenish-yellow flowers are borne in compact, erect clusters. The fruits are small yellowish-green berries that turn a waxy blue-gray in fall and winter.

Poison-oak produces new leaves and flowers in spring. The leaves turn brown or mottled red in fall before dropping off.

Poison-ivy

Toxicodendron radicans (L.) Kuntze (=Rhus radicans L.)

Poison-ivy (fig. 77) grows in moist, heavily forested areas. It is not so common in the pine uplands as poison-oak.

It usually grows as a slender, branched vine firmly attached to trees by fine aerial roots, but it may develop a stout woody stem near the ground. If it has no tree to climb, it spreads or sprawls weakly.

The leaves have three leaflets that are finer, thinner, more pointed, and more even-margined than poison-oak leaflets. The tiny flowers and fruits are usually borne well up in a tree; they resemble those of poison-oak, except that the berries are rougher (papillose) at maturity. The leaves turn bright red after frost kills them.



FIGURE 75.—YELLOW JESSAMINE.

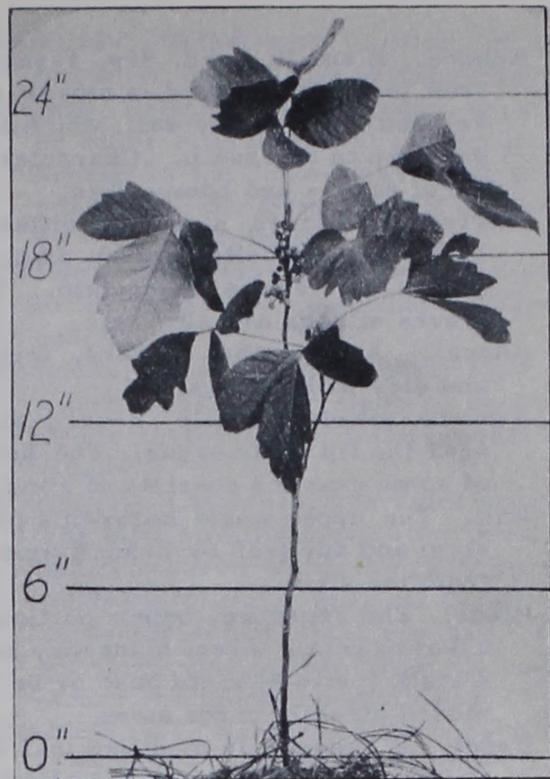


FIGURE 76.—POISON-OAK:
Growth habit in early summer

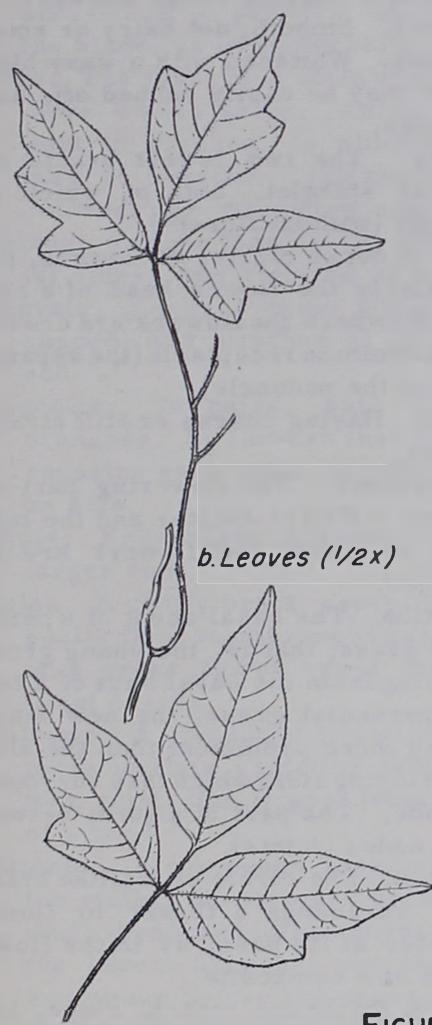


FIGURE 77.—POISON-IVY.



a. Vines

GLOSSARY

Achene. A small, hard, dry, 1-seeded fruit in which the seed is closely enveloped by the ovary wall, which does not open to release it. Characteristic of sedges and composites.

Alternate. Placed singly at different levels (not opposite) on an axis, as leaves or flowers on a stem. The leaves of oaks are alternate.

Annual. A plant that flowers, fruits, and dies within a year.

Awn. A slender bristle, usually at or near the tip of an organ. The beard of some grasses consists of awns.

Axil. The upper angle between a plant stem and any leaf or branch arising from the stem.

Blade. The expanded, upper portion of a leaf or petal. A leaf blade may have a stalk (petiole) at its base or be attached directly to the stem.

Bract. A reduced or modified leaf associated with a flower or subtending a flower cluster.

Bulb. An underground leaf bud composed of fleshy scales or coats, such as an onion bulb.

Berry. A simple, fleshy, usually small fruit.

Calyx. The sepals (sometimes partly united) of a flower taken together; the outer, usually green, portion of a flower consisting of the series of floral envelopes (perianth) below the corolla.

Capsule. A dry fruit, composed of more than one division, which opens to release the seeds.

Catkin. A long, drooping flower cluster (inflorescence) in which the small, stemless flowers are subtended by bracts or scales. The male and female flowers are usually borne in separate catkins, as in oaks and willows.

Ciliate. Fringed with hairs on the margin, like an eyelash.

Collar. The area on the outside of a grass leaf where the blade and sheath join.

Compound. Composed of two or more separate but similar parts joined together.

Cordate. Heart-shaped, with the notch at the bottom.

Corolla. The petals (sometimes partly united) of a flower taken together; or the inner set of floral envelopes (perianth), within and above the calyx.

Culm. The stem of a grass.

Dentate. Toothed; a margin indented by even teeth, pointing outward.

Disk flower. The tubular, regular flowers of the composites that are crowded in the center of the flower head. Contrast with ray flower.

Drupe. A fleshy fruit with a hard seed in the center, like a plum.

Fertile. Capable of producing fruit or functioning in reproduction. The opposite of sterile.

Floret. A small flower, usually one of a dense cluster, especially in grasses and sedges. The grass floret consists of the stamens, the pistil, and two bractlike organs--the lemma and palea.

Forb. A broadleaved herb--sometimes called a weed by range workers.

Glabrous. Smooth, not hairy or rough.

Glaucous. Whitened with a waxy bloom that may be easily rubbed off, as in grapes.

Glumes. The two lowest bracts of a grass spikelet, both of which are empty (without florets).

Head. A dense cluster of flowers, particularly the flower head of a composite where the flowers are crowded on a common receptacle (the expanded top of the peduncle).

Hirsute. Having coarse or stiff straight hairs.

Inflorescence. The flowering part of a plant; a flower cluster and the manner in which the flowers are arranged.

Innovation. The basal shoot of a perennial grass; that is, the young growth arising from the basal buds of a tufted perennial grass, the new leaves being more prominent than the short developing stem which they surround.

Internode. The part of a stem between two nodes (joints).

Involute. The circle of leaflike bracts that surrounds a flower or flower cluster at its base, as in the flower head of a composite.

Keel. A thickened central ridge, like the keel of a boat.

Lanceolate. Lance-shaped; or several times longer than broad, but broader below the middle, and tapered at both ends.

Leaflet. A single division of a compound leaf.

Lemma. The lowest, outer bract of a grass floret. In a single-flowered spikelet it is on the opposite side of the second glume and above it.

Ligule. A thin, membranous, hairy, or ridgelike appendage inside a grass leaf where the blade and sheath join.

Linear. Linelike; long and narrow with the sides parallel, such as most grass leaves.

Membranous. Thin and somewhat transparent like a membrane. The glumes, lemmas, or paleas of grasses are mostly membranous.

Midrib. The central or main rib of a leaf,

Nectary. A small gland, usually on the inside of a flower at the base, that secretes a sugary liquid. Glands may also occur on petioles, mostly below the blade, as in showy partridge-pea.

Node. The place on a stem where one or more leaves arise. Often called a joint in grasses, in which family it may be swollen, thickened, dark-colored, or otherwise conspicuous.

Oblong. Longer than broad, with parallel sides, and rounded at both ends.

Obovate. Reverse-ovate (reverse-egg-shaped) and attached at the smaller end.

Opposite. In pairs, said of leaves, branches, or flowers that are placed opposing each other on either side of an axis.

Ovate. Egg-shaped and attached at the larger end.

Palea. A chaffy bract, especially the usually thin, membranous second bract of a grass floret above the lemma (first bract).

Palmate. A compound leaf with three or more leaflets radiating from a common point like fingers from the palm of a hand.

Panicle. A compound raceme; that is, the stalked flowers are arranged in a much-branched inflorescence in which the lowest branches are the longest and bloom before the upper. The inflorescence of many goldenrods, and of panicums and numerous other grasses, is a panicle.

Papillose. Beset with papillae, or diminutive, pimple-like protuberances.

Pappus. Bristles, awns, scales, bracts, or other appendages at the top of an achene in the composites. The pappus aids in the dispersion of the fruit by wind and animals.

Pedicel. The stem of an individual flower or fruit of a compound inflorescence.

Peduncle. The common flower stalk of a compound flower cluster, or of a single flower if the inflorescence is simple.

Perennial. Lasting for 3 or more years. The plant may die down to the persistent crown from which new growth proceeds the following year, as in herbaceous tufted perennial grasses, or put forth new growth from the rootstocks, as in swamp sunflower.

Perianth. The floral envelope consisting of the calyx (sepals) and corolla (petals).

Petal. A division of the corolla, especially when the parts are separate as in roses and buttercups; petals may, however, be united as in honeysuckle. They are often expanded and brightly colored.

Petiole. The stalk of a leaf, whether simple or compound, whereby it is attached to the stem.

Pinna. A main or primary division of a pinnate leaf.

Pinnate. A compound leaf in which the divisions (leaflets) are arranged as in a feather (pinna) on either side of a common axis (rachis or "stem"). The leaflets may be opposite or alternate in arrangement.

Pistil. The female, seed-bearing organ of a flower.

Pod. A type of dry fruit that opens to release the several seeds. The term was originally used to refer to the one-celled fruit of a legume; e. g., a pea pod.

Prickle. A sharp, pointed protuberance arising from the superficial or outer part of a stem or petiole. Spines and thorns come from deeper layers and are not so easily rubbed or stripped off.

Pubescent. Hairy, with short, soft, or downlike hairs which are sometimes not clearly apparent to the naked eye.

Raceme. A simple inflorescence in which the individual flowers have stems (pedicels) and are arranged on an elongated axis.

Rachis. The main (central) axis of a raceme, spike, or panicle, or of a pinnately compound leaf.

Ray flower. An irregular, strap-shaped flower of the composites often mistaken for petals. They occur either on the margin of a flower head or throughout an entire head (as in the dandelion).

Receptacle. The upper, expanded portion of a peduncle or pedicel on which the flower parts are situated or on which a group of flowers occurs, as in the head of a composite flower.

Rhizome. A creeping, underground, jointed stem, rooting below and bearing scalelike leaves on the upper side.

Rootstock. A rootlike stem under or sometimes on the ground.

Rosette. A circular (often basal) cluster of leaves radiating from a central point--as the winter rosette of some panicums.

Scale. A thin, membranous, colorless structure, usually a reduced leaf on a rhizome. Also a modified leaf associated with a flower or leaf bud, a fleshy modified leaf of a bulb, and certain other structures.

Scape. A leafless flower stalk arising directly from the underground parts of a plant that is otherwise apparently stemless; e. g., a dandelion flower stalk.

Seed. A ripened ovule or body consisting of the embryo and its proper coats.

Sepal. A division of the calyx, especially when the parts are separate.

Sessile. Seated, or attached directly without a stalk. All the flowers of a spike (inflorescence) are sessile.

Sheath. The lower portion of a leaf--in grasses, sedges, rushes, and some other plants--that encloses or envelopes the stem. The upper part of the leaf is the blade.

Spatha. A usually large, leaflike, sheathing bract or bracts, frequently membranous, associated with an inflorescence. The inflated, copper-colored spathes of Elliott bluestem are conspicuous when this grass is in flower.

Spatulate. Spatula-shaped, with a round, broad tip and narrowed base--a form of leaves, petals, sepals, etc.

Spike. A simple, elongated flower cluster (inflorescence) in which the individual flowers are stemless. The flowers of gayfeathers are borne in spikes.

Spikelet. The principal unit of a grass or sedge inflorescence, consisting of two glumes (bracts) and one or more florets.

Stamen. The pollen-producing organ of a flower; the male floral organ.

Sterile. Barren, not fertile.

Stipule. One of a pair of small appendages at the base of a leafstalk (petiole). The petioles of many legumes have stipules at their base.

Stolon. A runner or any basal stem that will root when it touches the soil.

Tuber. A short, thickened, underground stem having numerous buds or eyes. A potato is a tuber.

Umbel. An umbellalike flower cluster, in which the pedicels arise from a common point. The outer flowers bloom first. The flower clusters of members of the carrot family (Umbelliferae) are umbellate.

Villous. Hairy, with long, soft hairs that are usually easily visible to the naked eye.

REFERENCES

- Anonymous. 1941. The establishment of common Bahia grass from seed. Ga. Coastal Plain Expt. Sta., Tifton, Ga. Mimeograph Paper 6, 37 pp.
- Allison, J. L. 1948. Some diseases of forage grasses. Grass, U. S. Dept. Agr. yearbook 1948, pp. 261-266.
- Biswell, H. H., Shepherd, W. O., Southwell, B. L., and Boggess, T. S., Jr. 1943. Native forage plants of cutover forest lands in the Coastal Plain of Georgia. Ga. Coastal Plain Expt. Sta., Tifton, Ga. Bul. 37, 43 pp.
- Britton, N. L., and Brown, A. 1936. An illustrated flora of the northern United States, Canada and the British possessions. Ed. 2, 3 v. N. Y. Botanical Garden.
- Brown, C. A. 1945. Louisiana trees and shrubs. La. Forestry Com. Bul. 1, 262 pp.
- Campbell, R. S., and Cassady, J. T. 1951. Grazing values for cattle on pine forest ranges in Louisiana. La. Bul. 452, 31 pp.
- Crooks, D. M., and Kephart, L. W. 1951. Poison-ivy, poison-oak, and poison sumac: identification, precautions, eradication. U. S. Dept. Agr. Farmers' Bul. 1972 (rev.), 30 pp.
- Dayton, W. A. 1931. Important western browse plants. U. S. Dept. Agr. Misc. Pub. 101, 214 pp.
1950. Glossary of botanical terms commonly used in range research. U. S. Dept. Agr. Misc. Pub. 110 (rev.), 41 pp.
- and others. 1937. Range plant handbook. U. S. Dept. Agr.
- Fernald, M. L. 1950. Gray's manual of botany. Ed. 8, 1632 pp. American Book Co., N. Y.
- Gates, F. C. 1941. Weeds in Kansas. Kas. State Bd. Agr., Topeka, 360 pp.
- Gowanloch, J. N., and Brown, C. A. 1943. Poisonous snakes, plants and black widow spider of Louisiana. La. Dept. Conserv., New Orleans, 133 pp.
- Graham, E. H. 1941. Legumes for erosion control and wildlife. U. S. Dept. Agr. Misc. Pub. 412, 153 pp.
- Harlow, W. M., and Harrar, E. S. 1950. Textbook of dendrology. Ed. 3, 555 pp. McGraw-Hill Book Co., N. Y.

- Harrar, E. S., and Harrar, J. G. 1946. Guide to southern trees. 712 pp. McGraw-Hill Book Co., N. Y.
- Hitchcock, A. S. 1951. Manual of the grasses of the United States. U. S. Dept. Agr. Misc. Pub. 200. Ed. 2 (rev. by Agnes Chase). 1051 pp.
- Hoover, M. M., Hein, M. A., Dayton, W. A., and Erlanson, C. O. 1948. The main grasses for farm and home. Grass, U. S. Dept. Agr. yearbook 1948, pp. 639-700.
- Kelsey, H. P., and Dayton, W. A. 1942. Standardized plant names. Ed. 2, 675 pp. J. Horace McFarland Co., Harrisburg, Pa.
- McKee, R. 1948. The main species of legumes. Grass, U. S. Dept. Agr. yearbook 1948, pp. 703-726.
- Muenscher, W. C. 1951. Poisonous plants of the United States. Rev., 277 pp. Macmillan Co., N. Y.
- Pechanec, J. F. 1936. The identification of grasses on the upper Snake River Plains by their vegetative characters. *Ecology* 17: 479-490.
- Preston, R. J., Jr. 1948. North American trees. 371 pp. Iowa State Col. Press, Ames, Ia.
- Reid, E. H. 1942. Important plants on national forest ranges of eastern Oregon and eastern Washington. Pacific Northwest Forest and Range Expt. Sta., Range Res. Rpt. 1, 64 pp.
- Sampson, A. W. 1917. Important range plants: their life history and forage value. U. S. Dept. Agr. Bul. 545, 63 pp.
- Shaw, A. O., Biswell, H. H., Foster, J. E., and Collins, R. W. 1943. Some stock-poisoning plants of North Carolina. N. C. Agr. Expt. Sta. Bul. 342, 12 pp.
- Small, J. K. 1933. Manual of the southeastern flora. 1554 pp. New York (published by the author).
- Van Dersal, W. R. 1938. Native woody plants of the United States, their erosion-control and wildlife values. U. S. Dept. Agr. Misc. Pub. 303, 362 pp.
- Wahlenberg, W. G., Greene, S. W., and Reed, H. R. 1939. Effects of fire and cattle grazing on longleaf pine lands as studied at McNeill, Miss. U. S. Dept. Agr. Tech. Bul. 683, 52 pp.

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<u>celtidifolia</u>	86	<u>Vines, woody</u>	100
<u>Spikesedge, annual</u>	56	<u>Waxmyrtle, dwarf</u>	100
<u>Sporobolus junceus</u>		<u>southern</u>	100
<u>(=S. gracilis)</u>	44	<u>Weeds</u>	68
<u>poirettii</u>	44	<u>Wildindigo, Nuttall</u>	76